AUGUST 1959

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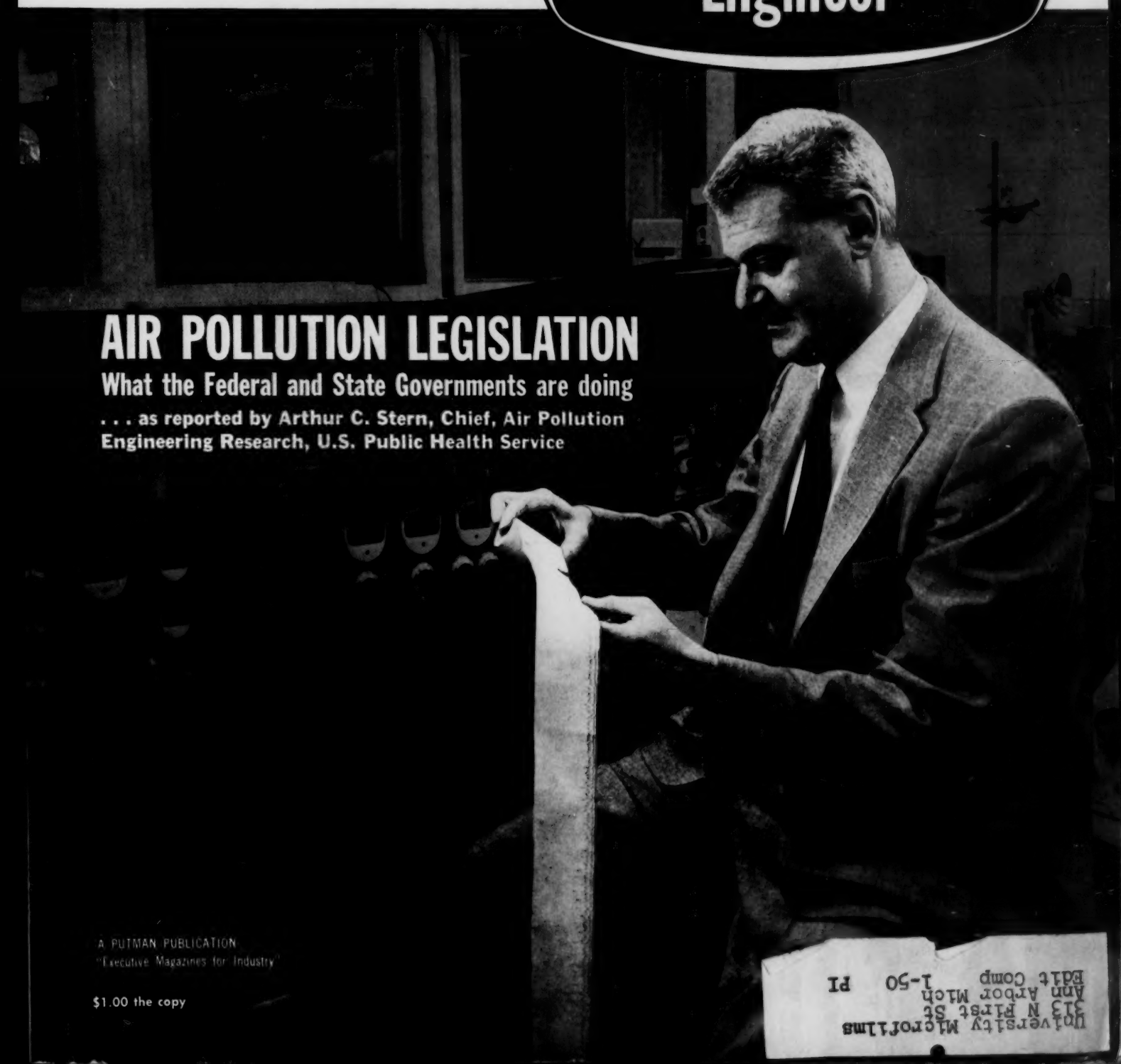
Plant and Power Services Engineer



AIR POLLUTION LEGISLATION

What the Federal and State Governments are doing

. . . as reported by Arthur C. Stern, Chief, Air Pollution Engineering Research, U.S. Public Health Service

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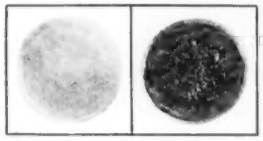

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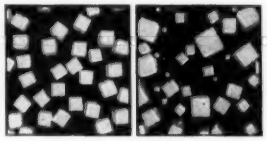

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Circle 9274 inside back cover.

THAT'S INTERESTING

Water treatment takes to the air

Because of the almost pure water required for power augmentation during jet airline takeoff, a 100 gallon per minute demineralizer is hard at work in Pan American's new Boeing 707 International planes.

At a 100 gallons a minute, the unit manufactured by Penfield Mfg. Co., Meriden, Conn., takes impure New York city water (53 parts per million solids) and ejects, into a epoxy-coated 750-gallon filling truck, water as pure or purer than five parts per million solids.

Latest in plastics — canal linings

As part of the continuing search for satisfactory and low-cost lining for irrigation canals, an experimental test section of buried plastic membrane lining was constructed on a lateral of the Heart Mountain Division, Shoshone Project, Wyo. The work was accomplished in the fall of 1957, and a prefabricated, black, vinyl plastic material eight mils in thickness was used for the 400-foot long experimental installation.

Made from the drafting table

The world's first unlimited capacity shape-cutting machine that can automatically reproduce metal parts from pencil sketches on ordinary paper has been introduced by the Linde Co., Division of Union Carbide Co.

A single operator sitting at an easy-to-use control panel can control tracing, ignition, preheat, cutting oxygen, height adjustment of the torches, movement of the carriage and positioning of the tracer.

Sept. 7-11: Annual National Conference of Illuminating Engineering Society; Fairmont and Mark Hopkins Hotels, San Francisco, Calif.

Sept. 20-25: 14th Annual Conference and Exhibit of the Instrument Society of America; Chicago, Ill.

Sept. 27-29: 1959 National Power Conference; Hotel Muehlebach, Kansas City, Mo.

Sept. 28-Oct. 1: American Welding Society Fall Meeting; Sheraton-Cadillac Hotel, Detroit, Mich.

Oct. 6-9: Stanford Research Institute International Symposium; Asilomar, Monterey Peninsula, Calif.

Oct. 7-9: ASME-AIME Solid Fuels Conference; Cincinnati, Ohio.

Oct. 12-14: 1959 National Electronics Conference; Hotel Sherman, Chicago, Ill.

Oct. 22-23: 15th Annual National Conference on Industrial Hydraulics; Hotel Sherman, Chicago, Ill.

Oct. 29-30: 1959 Electronics Devices Meeting; Shoreham Hotel, Washington, D.C.

Nov. 2-5: 11th Exposition of Air-Conditioning and Refrigeration Industry; Convention Hall, Atlantic City, N.J.

Nov. 2-5: National Metal Exposition; Morrison Hotel, Chicago, Ill.

Nov. 9-13: National Electrical Manufacturers Association Annual Meeting; Traymore Hotel, Atlantic City, N.J.

Nov. 16-20: Fifth International Automation Congress and Exposition; New York Trade Show Building, New York, N.Y.

Nov. 23-24: Instrument Society of America Symposium; Ben Franklin Hotel, Philadelphia, Pa.

Nov. 29-Dec. 4: ASME Annual Meeting; Chalfonte Haddon Hall, Atlantic City, N.J.

Nov. 30-Dec. 4: Exposition of Chemical Industries; New York Coliseum, New York, N.Y.

Dec. 1-4: National Warm Air Heating and Air Conditioning Committee Meetings and Annual Convention; Chase Hotel, St. Louis, Mo.

When you select dry-type transformers initial costs can be false economy

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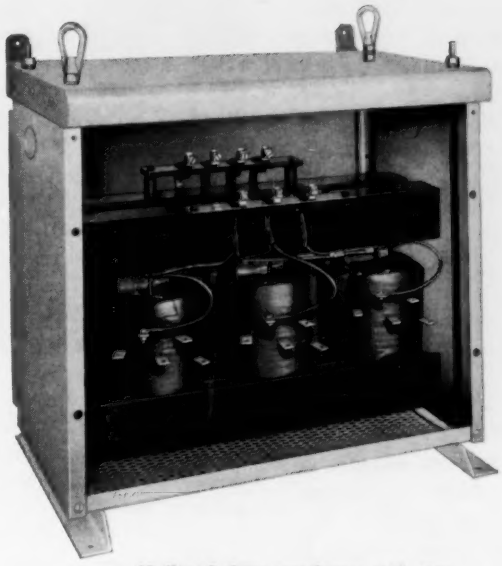
SOUND-RATED DRY-TYPE
TRANSFORMERS

The first cost of dry-type transformers is not always the final cost. Don't be misled; the lure of lower prices often camouflages operating and installation costs. SORGEL SOUND-RATED DRY-TYPE TRANSFORMERS are designed and constructed for long life. They provide the absolute ultimate in operating efficiency, ease of installation, overload capacity and long-range economy.



45 Kva 3-phase transformer with taps. Interchangeable wall or floor mounting. Front panel removed, showing interior.

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Circle 9275 inside back cover.

Specifically speaking about this issue

Are you having trouble with bearing wear and burnout? If so, you'll be interested in learning how Continental Motors eliminated excessive bearing wear in its power house by using a non-soap grease with an organic type thickener. This grease doesn't wash out or harden on hot well pump or stoker drive shaft service. Editor Audie Countryman visited the installation and obtained this interesting story from Continental Motors' power engineers.

HIGH-TEMP LUBE

States' governmental activities in air pollution control is increasing. There has even been talk about the Federal Government's entry into the field. Just what's going on in State and Federal governments is the subject of this month's cover story. Arthur C. Stern, Chief of the Federal's Air Pollution Engineering Research, gives the latest on air pollution laws.

AIR POLLUTION

When a new product is introduced, it must be proved in an actual installation. Such is the case for an insulation with a built-on aluminum jacketing that was placed on the market last fall. This first installation was on high-temperature hot water service at Behr-Manning Company. Engineers Tom McMahon and Dick Clarke tell how the product cuts installation time, gives maintenance savings, and offers top-notch insulation with its very low "K" factor.

NEW INSULATION

Accurate sampling for analysis of all coal received from a supplier is an important operation, especially when the purchase is on a delivered price per Btu basis. New York's Hickling Station uses an automatic crusher-sampler to get an accurate sample for analysis. The device eliminates 32 of the 34 hand-sampling steps and crushes the coal to sizes of six mesh and finer with a large percentage of 20 mesh or less, giving a true sample.

COAL SAMPLING

Pre-operation testing and maintenance of electrical equipment will account for large savings in the future. The Gary Sheet and Tin Mill of U.S. Steel has set up a really efficient testing and maintenance program with the use of a mobile, DC, high-potential tester for measuring dielectrical strength, insulation resistance and dielectrical absorption in cables, substations, motors and generators in various parts of the plant.

ELECTRICAL TEST

A cure for raw water and gas handling troubles has been found in the use of diaphragm valves at Union Electric Company's Venice Station. With these valves, the utility has stopped excessive seat wear and leakage on these low pressure services. Editor, H. A. Countryman, took a tour of the plant and talked to assistant superintendent George Mills to obtain pictures and story on the way to solve such problems.

LEAKLESS VALVES

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AUGUST, 1959
VOLUME 1 NUMBER 4
(as Plant and Power Services Engineer)

Plant and Power Services Engineer

Serving the key engineers and consultants who are responsible for both plant services and power services throughout all industry, in utilities and large public service installations.

IN THIS ISSUE

6 U.S. power production still on the rise
15 Non-soap grease resists high heat and water — H. A. COUNTRYMAN
16 What you should know about Air Pollution Legislation — A. C. STERN
18 Insulation with built-on aluminum jacketing cuts installation time
20 Automatic coal sampling assures optimum kilowatt output
22 Diaphragm valves cure raw water and gas handling troubles — H. A. COUNTRYMAN and G. MILLS
23 Mobile DC tester improves electrical equipment maintenance
24 Neoprene belt has been running 21 years
25 Improves heat distribution by getting it off the floor
27 Infrared analyzers warn when fuel fumes reach danger point
28 Provides accurate steam pressure control
30 Underfloor wiring systems have increased capacity

MONTHLY FEATURES

2 THAT'S INTERESTING
3 CONVENTIONS & EXHIBITS
6 REPORTS IN BRIEF
12 ASSOCIATION NEWS
14 LETTERS
24 NEW SOLUTIONS
28 NEW DEVELOPMENTS
38 NEW LITERATURE
41 ENGINEERING DATA
46 PHOTO NEWS

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- **traction motors and generators**
- **wiring and cable installations**

Compact portable set is housed in shock and wear resistant case for severe field use in testing reconditioned equipment after installation, as well as for preventive maintenance of installed equipment. Also available in a bench model for making acceptance and proof test on electrical insulating systems for quality control in manufacturing and repair. For complete description, specifications and prices, WRITE FOR BULLETIN 22-5-PI.

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Circle 9276 inside back cover.

March showed further rise in power production

Electric power production by both utilities and industrial plants showed a sharp rise in March over the previous year.

Utility production in the U.S. totaled 58,351 mkwh in March, 1959. This is the highest March production total of record and an increase of 10.9 per cent over the 52,623 mkwh for March 1958. Hydro production in March 1959 was 5.4 percent below March 1958 while production by fuel-burning plants was 16.1 percent higher.

Production by power plants of industrial concerns was 7537 mkwh in March this year, an increase of 15.3 percent over March 1958.

Combined utility and industrial production this last March was 65,888 mkwh, an increase of 11.4 per cent over March 1958. Utility and industrial generating capacity totaled 163 mkw on March 31, this year.

We need more work from less water

Engineers must accept the challenge of making less water do more work in various manufacturing processes, according to R. M. Critchfield, General Motors vice-president.

Addressing the opening session of a two-day course on Industrial Water Conservation presented by The University of Michigan School of Public Health, he said industrial plants can be built anywhere, but that water has become one of the most vital problems facing industry today.

Pointing to modern achievements in transportation, Critchfield said, "We can establish markets and get transportation to these markets. But if the plant runs out of water it is dead overnight. All life, industrial and otherwise stops when water is taken away."

In the light of present knowledge, he said most industries have "very good and usually expensive waste treatment plants — which make sure that no toxic materials are discharged to the stream."

But so far as water conservation and reuse are concerned, he added, "We should look forward to further development of our industrial waste treatment processes."

The three basic reasons for cutting down water usage in GM plants, Mr. Critchfield explained, are:

1) To assure minimum usage from plant community water supplies, in line with business requirements.

2) To keep water usage within physical limitations of equipment and sewers already installed.

3) To cut the cost of water usage.

Cyclic utility buying costly

Power people run the risk of paying unnecessarily high prices for their capital equipment due to the practice of booking orders in bunches, warns William F. Crawford, president of Edward Valves, Inc., and Republic Flow Meters Company.

Mr. Crawford adds that this cyclic buying, plus taxation and the current labor climate are shifting the burden of pioneering research and development in industry from the manufacturer to the ultimate owner.

Equipment manufacturers supplying the power industry, he pointed out, have seen their incoming orders vary by

a factor of five-to-one over a two-year period. This widely fluctuating demand ultimately could raise equipment prices for several reasons: (1) materials cost more; (2) use of labor is inefficient; (3) engineering service is erratic; and (4) deliveries cannot be made on schedule.

Mr. Crawford commended the industry for its long history of greater-than-average cooperation between manufacturers and suppliers, but cautioned that even greater cooperation will be necessary in the future as the burden of pioneering shifts to the ultimate owner.

Fiber metals

Fiber metallurgy — a new process of metalworking which is expected to revolutionize products ranging from rocket nozzles to filters — has been developed by the Armour Research Foundation of Illinois Institute of Technology.

In the new process, thin fibers of metal are interlocked like a felt cloth and bonded together with heat to produce a material with reduced weight at little sacrifice of strength.

Finished fiber metal product may look, feel, and in many ways act like a solid metal sheet, but actually be 80 per cent air. This high-strength, low-weight quality immediately suggests a variety of aircraft and rocket applications. Another type of fiber metal material may have high density and still be highly and uniformly porous, suggesting use as a filter for both liquids and gases.

Potential applications are those that employ a fiber metal network in conjunction with other materials: with plastics, for instance, to strengthen a good gasket material that is presently too weak for many applications; with other metals, to fabricate such things as stronger, non-sagging lead pipes; and with ceramics in what is probably the most exciting new possibility, to make what might be called "reinforced concrete in miniature" — relatively light and almost unbelievably strong.

See record year for utility capacity increase

New electric power generating capacity scheduled to go on the line in 1959 is 14,334,000 kw, compared with last year's record addition of 14,104,000 kw, according to the 25th semi-annual electric power survey of the Edison Electric Institute.

The new additions will bring the total power producing capability of the electric utility systems in the United States to about 158,000,000 kw by the end of this year.

Scheduled installations of new generating equipment from 1959 through 1962 and later totals more than 42,000,000 kw.

Peak load for the contiguous United States (excluding Alaska and Hawaii) in December of this year is predicted in the survey as 124,000,000 kw, or 9.8 percent above the 113,000,000 for December, 1958. Peak load for December, 1962, is forecast at about 153,000,000 kw, representing an average annual increase for the 10-year period ending in 1962 of 7.8 percent, or the equivalent of doubling in 9.2 years.

Gross margin of generating capability over demand is estimated to be about 27.5 percent next December, a fractional increase over the 27.1 percentage figure reported in December, 1958. Gross margins are expected to remain close to 25 percent through 1962, according to present forecasts.

NEXT MONTH
IN
PLANT and POWER SERVICES ENGINEER

- ***A Policy for Labor and Management in Today's Highly Technological Industry:*** Food for thought from JAMES P. MITCHELL, Secretary of Labor
- ***Geothermal Power Comes to the United States:*** A special report by Managing Editor, George Michael
- ***Northernmost Heat Pump Finishes First Year of Operation:*** Photographs and line drawings describe heat pump used for both summer cooling and winter heating

WHO SWIPED PAGE 43

D'ja ever pick up a copy of PLANT and POWER SERVICES ENGINEER with an article torn out . . . or even worse, HALF an article torn out?

It's liable to happen when copies are routed around your plant.

You can avoid this annoyance by getting your own copy of PLANT and POWER SERVICES ENGINEER each month if you qualify. It's easy and there is no charge. Just fill in the subscription request form opposite the inside front cover.

REPORTS IN BRIEF

Shelve AEC subsidies for private nuclear power plants

The AEC's proposal for capital subsidies to encourage private building of nuclear power plants has been shelved by Congress. A bill reported out by the joint Committee on Atomic Energy confined itself to construction of small to medium government power plants, for which the AEC was authorized to spend $165.4 million in the next fiscal year.

It is believed the subsidy plan for construction of private plants will be resurrected next year.

Dustlaying made easy

If you have a dust problem around your plant, you may want to get a copy of "Dustlaying with Calcium Chloride." It tells how longer lasting dustlaying can be accomplished than with water. Methods and quantities of application are given along with complete instructions for storage and handling of calcium chloride.

You can get your free copy Brief MB-11, "Dustlaying wth Calcium Chloride" by writing to the Calcium Chloride Institute, 909 Ring Building, Washington 6, D.C.

More sea water conversion

World's largest single installation for converting sea water to fresh water has been completed on the semi-arid Dutch island of Aruba in the Caribbean Sea, some 15 miles off the Venezuelan coast.

The $11,000,000 plant, designed and built for the Aruban Government by Singmaster & Breyer, Inc., is the first ever constructed which combines salt water distillation with the production of marketable surplus electricity (15,000 kw installed capacity).

REPORTS IN BRIEF

The Aruba plant has a rated capacity of 2,700,000 gallons of distilled water per day. This is more than enough to supply all the potable water requirements of the island's 55,000 inhabitants. A substantial quantity is also piped to the island's major industry —the vast refinery of the Lago Oil & Transport Company, Ltd., a Standard Oil Company (New Jersey) subsidiary.

Production cost for the plant has been tentatively estimated at $1.75 per 1000 gallons of fresh water, although a lower figure is expected when exact cost data reflecting power revenues become available. Price to the consumer is of course greater, since it includes distribution expenses.

Furnace tests atomic fuel elements up to 5000°F

Temperatures as high as 5000°F — one half the surface temperature of the sun — are being produced by GE scientists in the AEC's Hanford plant.

They are using a carbon arc image furnace that works on the same principle as that used to light fires with a magnifying glass. Light rays from an air blown water-cooled carbon arc are reflected from a parabolic mirror in one end of the furnace to another such mirror in the other end.

The second mirror focuses the light rays on a specimen placed inside a quartz envelope containing a helium atmosphere. Steam can be added to the atmosphere to approximate conditions inside a reactor when a fuel element ruptures.

The Hanford high-temperature furnace is designed so that moving or still pictures of a ceramic material specimen can be made while it is being heated. During all phases of the experiment, the specimen can be observed through microscopes, and photographs can be taken in black and white or in color.

Observations of ceramic fuel elements at extreme temperatures is important, the scientists explained because their high-temperature behavior inside a reactor is the key to higher power levels.

Report lower cost nuclear power with OMR

Competitive nuclear power in a few years using an organic cooled and moderated reactor (OMR) of 300,000 kw is indicated in a report to the AEC Bechtel Corporation and Atomics International, a division of North American Aviation, Inc.

Results of the study indicate that a large organic cooled and moderated central station atomic power plant can be expected to show generation costs of 8.1 mills per kwh at an 80 percent plant capacity factor. This includes all costs such as escalation and interest during construction.

The study also determined that a promising concept for an intermediate sized plant was an organic cooled and moderated reactor of 75,000 kw output. Construction estimates, schedules and operating expenses were established for a hypothetical site.

An evaluation of technical feasibility and costs on various organic cooled concepts was completed, including alternate moderators, physical arrangements and fuels.

Advantages of using an organic material as both coolant and moderator in a reactor are simplicity of design, relative low cost and high inherent safety.

"I'm telling you . . . This stuff really cured my ulcers."

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automatic tube expansion control

rolls ¼"-1½" O.D. tubes pneumatically faster than you ever thought possible. Average worker easily rolls up to 12 tubes per minute.

Here's why . . .

Operator dials desired torque in ft.-lbs. on micrometer head. Precision torque-sensing mechanism automatically stops expansion at this setting . . . maintains .001" accuracy consistently. Result? More work per man-hour, operator error eliminated. Write for Bulletin No. 64 or plant demonstration.

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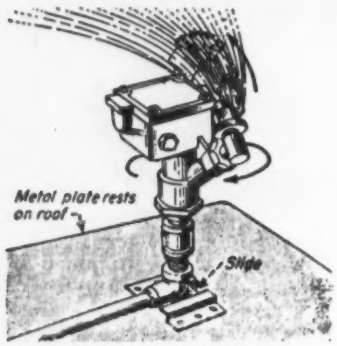


COOL any building from the ROOF

Everyone knows how the sun, beating down on the roof of a building, descends into the interior. It makes the occupants uncomfortable and ruins merchandise.
Roof cooling is the answer. It can be used on any roof to keep the building cool or to save air conditioning costs. Best equipment for the job is Ruppright's Rotary Roof Cooler. Easily installed, it produces a thin film of water on the roof. This film evaporates but is continuously renewed by the slowly-rotating cooler making the roof cooler than the air.

INSTALLED WITHIN A FEW HOURS

RUPPRIGHT'S ROTARY ROOF COOLER

P.O. Box 43555 pl, Los Angeles 43, Calif

Circle 9279 inside back cover.

LOOKING FOR AIR FILTERS?

- Read about the latest development in air filters.
- This story is in the New Developments section which starts on page 28.
- You'll find descriptions of many other types of plant and power services equipment there, too.

To build 5-kw thermoelectric generator

The Bureau of Ships, United States Navy, has awarded a contract to Westinghouse to design, construct, test, and furnish a 5-kw thermoelectric generator.

The unit, which will convert the heat of a burning fuel directly into electricity, will have a power output larger than that of any generator of this type known to have been built.

It will be the first step in solving material selection, fabrication, assembly, and operating and control problems of a large-scale thermoelectric power plant. Heat source to power the generator will be a fuel readily available to the Navy, probably diesel oil or other Navy fuel oil.

Cool side of the Westinghouse generator will be maintained by cooling with water. Ordinary sea water will be used directly, if possible, although fresh water, cooled by sea water in a heat exchanger, will be used if necessary.

The utmost in flexibility will be built into the new thermoelectric power plant. Although intended to be the small-scale prototype of a shipboard installation, it may be used directly as a movable or portable power source to operate existing Navy electrical equipment.

Collective bargaining not for engineers

Four out of five scientists and engineers now oppose collective bargaining for themselves, a newly published University of Michigan study indicates.

The study is based on interviews with 277 non-supervisory professional employees in 10 large firms. Fields covered include mechanical, electrical, chemical, civil, electronic and automotive engineering.

Among those favoring some form of collective action about half spoke in terms of action by their professional societies, while the rest thought more in terms of conventional labor union activity.

Authored by Prof. John W. Riegel, director of the U-M Bureau of Industrial Relations, the study is titled "Collective Bargaining As Viewed by Unorganized Engineers and Scientists" (105 pages, clothbound, $4).

Fire-retardant paints for inside finishes

Recent flame-spread tests at the Underwriters' Laboratories in Chicago on fire-retardant paints show for the first time that highly combustible interior surfaces can be reduced practically to non-combustibilty with only one coat of a fire-retardant paint. Flame-spread characteristics of highly combustible fiber acoustical tile, for example, was reduced to less than 20, where 0 represents complete non-combustibility.

An extension of the rigid UL tests from a normal 10-minute fire exposure to that of 30 minutes on 2" Douglas fir, as used in roof deck areas, showed that a flame spread rating of less than 25 can be maintained with fire-retardant paints. This 30-minute test is under consideration as a standard by insurance regulatory bodies as an incombustible classification for rating purposes.

The fire-retardant paints have a unique ability to foam up or "intumesce" upon exposure to heat or fire. The black marshmallow-like blister so formed prevents flame spread and minimizes heat penetration by its insulation action. It provides the vital time delay which permits thorough evacuation of occupants and the opportunity for fire fighting equipment to attack and extinguish the fire.

This heat-insulating action upon exposure to fire, also offers protection to non-combustible material such as structural steel, roof deck supports, and solvent storage tanks.

REPORTS IN BRIEF

Fluorescent lamps with single base

A fluorescent tube lamp has been designed with a base on just one end. It does not require wiring and sockets for both ends of the lamp. Instead, lamp can be connected to a single socket much like a conventional incandescent light bulb.

A similar fluorescent lamp design consists of a U-shaped lamp, which has many of the advantages of the single-ended fluorescent tube, since all of the electrical wiring is confined to one end of the fixture.

Laboratory tests by Westinghouse scientists indicate that excellent efficiency and performance can be achieved with both of the new fluorescent lamp designs.

Some of the immediate uses for the new lamps include fluorescent installations above diffusing plastic or glass ceilings, street lighting, signs and displays, and for school lighting.

Future of private mobile radio

A synopsis of its views regarding the need for additional frequencies for private mobile radio has been prepared by Motorola, Inc. The synopsis is taken from written testimony recently filed with the Federal Communications Commission in a proceeding reviewing the frequency allocations in the 25-890 mc region of the radio spectrum.

The filing predicts that private mobile radio will increase fourfold during the next ten years. This expansion will require at least an additional allocation of 55 mc by enlargement of the three existing private mobile bands.

An elaborate colored chart showing present frequency allocations for 25 to 890 mc and Motorola's proposed allocations is included in the synopsis.

Copies of the synopsis booklet may be obtained from Motorola, Inc., Chicago, Ill.

specialized

Does business publication advertising pay?

No one is in a better position to give a hard-boiled, practical answer to this question than the men who spend their working lives on the sales front... the men the ads are supposed to help... the men who sell.

Here are the statements of salesmen who know what advertising does for them when it appears in the industrial, trade or professional publications that serve the specialized markets to which they sell:

Glen Chase
Yarnall-Waring Company
sells to industry

Says Mr. Chase:

"I have been selling *Yarway* products for over seven years, and I'll have to admit that I've taken the trade paper advertising for granted. But when I stop to think I realize it's out there working for me all the time.

"For instance, I never have to tell my prospects who YARNALL-WARING is, or what they make. Often I don't even have to tell them why they should see me and find out what I've got to offer. The advertising has done much of the *who, what,* and *why* of selling before I make my contact.

"Here's an example: I recently had a phone call from a potential customer that I'd never even called on. He was having trouble with a competitive product. He'd seen our ads and wanted to try my product. That's one time when my sale consisted merely of writing the order. Advertising really made the sale.

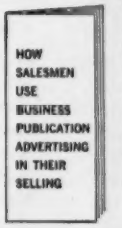
"The advertising has given people a good impression of our company, too. This is surprising, when you stop to think about it, because we are a relatively small organization.

"Our company name is YARNALL-WARING but a great many people say '*Yarway*'. I believe this use of our trade-mark may be due to the wide use of the company trade-mark in our trade paper advertisements, on our product name plates, shipping cartons and stationery."

Ask your own salesmen what your company's business publication advertising does for them. If their answers are generally favorable, you can be sure that your business publication advertising is really helping them sell. If too many answers are negative, it could well pay you to review your advertising objectives—and to make sure the publications that carry your advertising are read by the men who must be sold.

How salesmen use their companies' advertising to get more business

Here's a useful package of ideas for the sales manager, advertising manager or agency man who would like to get more horsepower out of his advertising. Send for a free copy of the pocket size booklet which reports the successful methods employed by eleven salesmen who tell how they get more value out of their companies' business publication advertising.



You can be sure that more of your salesmen will use your advertising after they read how others get business through these simple methods. The coupon is for your convenience in sending for your free copy.

NATIONAL BUSINESS PUBLICATIONS, INC.
Department 7E
1913 Eye St., N.W.
Washington 6, D. C. STerling 3-7533
Please send me a free copy of the NBP booklet "How Salesmen Use Business Publication Advertising in Their Selling."

Name _____
Title _____
Company _____
Street Address _____
City _____ Zone _____ State _____

National Business Publications, Inc.

NBP

...each of which serves a specialized market in a specific industry, trade or profession.

ASSOCIATION NEWS

. . . . reports of conventions, papers and people from associations of interest to plant and power services engineers

Points out importance of DC insulation test

Direct current overpotential testing "seems to offer the industrial maintenance program a method for approaching a nondestructive evaluation of insulation," was reported by W. A. Weddendorf of the Mutual Boiler and Machinery Insurance Co. at an AIEE district meeting in Atlanta, Georgia.

As plant engineers are becoming more and more maintenance minded and are constantly seeking new means of accident prevention, they have reconciled their thinking to conclude that it is a definite advantage to have an insulation breakdown at an opportune time under test rather than to experience a failure in service.

Interest in all phases of plant maintenance is being focused on methods of nondestructive testing. In his experience, Mr. Weddendorf said, "there has been no evidence to reflect damage to otherwise good insulation as the result of having been subjected to DC proof testing, nor has there been any case where insulation has failed in service after testing to indicate the DC voltage did not search out impending defects." Use of DC for overpotential testing "offers definite nondestructive testing advantages.

"In approaching the predetermined test level by the voltage-step method, leakage current-voltage and leakage current-time characteristics are developed.

These data can be interpreted, except in certain circumstances, as indicative of an impending insulation failure or give assurance to proceed with the testing."

Welded steel tubing in booklet

Welded carbon and stainless steel tubing is described in 12-page brochure. The tubing is said to have uniform wall thickness and strength, concentricity, easy workability and weldability.

Applications include mechanical, sanitary, architectural, hydraulic and structural.

(Welded Steel Tubing brochure is issued by The Formed Steel Tube Institute, Dept. P&PSE, 850 Hanna Bldg., Cleveland 15, Ohio.)

Nuclear plants, danger in earthquake zones

The eminent danger to industrial plants and personnel by the construction of nuclear plants in earthquake zones has been stressed by R. R. Alvy, chief engineer of the Nuclear Division of Holmes & Narver, at the American Society of Civil Engineers meeting in Cleveland.

Persons involved in the design of nuclear facilities anywhere may also be required to understand and design for the effects of seismic forces, because of the potentially dangerous hazards involved in the event of an earthquake.

Serious damage to a plant, such as the collapse of a water tower, the stack, the heat exchanger, or breaks in the piping could be caused by an earthquake.

If cooling water from the water tower was cut off by either collapse of the tower or failure in the piping, it is possible to have the reactor melt and release large quantities of radioactive fission products into the vapor container.

The vapor container holds all such radioactive gases. If not properly designed, however, anchor bolts may be stretched and leakage paths provided.

If the stack collapses and the bypass system also fails, there is the possibility of a major disaster, particularly to the plant operating personnel. If the leakage of radioactive gases is great enough, the health and lives of nearby communities can become endangered.

Aluminum conductor connector specs

Tentative specifications for connectors for aluminum conductors has been prepared by the Edison Electric Institute.

The report is issued as engineering information in the expectation that the suggested requirements may serve as an aid in preparing purchase specifications for electrical connectors.

The specifications cover devices used for making electrical connections between aluminum conductors, or aluminum conductors in combination with copper conductors.

The publication, No. 59-70, is issued by Edison Electric Institute, 750 Third Ave., New York 17, N. Y. Price is 30 cents per copy.

We need nuclear power standardization

Nuclear standards are key to low cost and safe nuclear power, was one of the subjects discussed by a group of industry and government experts during the Ninth National Conference on Standards.

Nuclear safety, safety for the workers in nuclear installations, and public safety for the communities in which nuclear installations are located is a grave concern of both industry and government.

An important consideration for industry is the high cost of nuclear equipment. Standardization, the experts agree, is a way to achieve both safety and reduction of cost.

Addresses of more than 50 important figures in industry and government given at the meeting have been published in book form.

The book "Standardization — What's In It for Me?" is composed of 50 papers, totals 128 pages with illustrations. It is available from the American Standards Association, Dept. PR 62, 70 East 45th Street, New York 17, N.Y., at $4.50 per copy.

Metallized coating test results available

Results of a corrosion test evaluation program for metallized coatings have been made available by the American Welding Society after an exposure period of 3 years. The findings are claimed to be the only authoritative data on the corrosion resistance of metallized coating to many corrosive environments.

Over 4300 specimens were exposed at 8 test sites. The major objectives are to determine the life of the coating in each environment, to determine the effect of various methods of preparation of the steel, and to determine the increase in life of the zinc and aluminum coatings with seal coatings added.

The AWS Committee on Metallizing selected locations where panels could be exposed to rural, industrial, salt-air and salt-spray environments. Panels were to examined at 3, 6, 9 and 12 year intervals.

An illustrated reprint of the complete report giving test sites, test results, atmospheric exposure and a comparison of aluminum and zinc-sprayed panels, is available from the American Welding Society, Dept. T., 33 West 39th Street, New York 18, N.Y. Price is 50 cents.

Hydraulic Institute Standards

The tenth edition of the Standards of the Hydraulic Institute has now been revised, and the affected pages are available to owners of the book. These revised pages are printed on colored stock for insertion in the original loose-leaf cover. The cost is $1.25 per set, shipping included.

The inclusion of these revisions in existing copies will bring those copies up to date with respect to technical developments in the industrial pump field.

Some of the important changes are: numerous clarifications and corrections involving drawings, nomenclature, and text. New definitions — flooded suction, specific speed, and self-priming pumps. Dimensions of NEMA type C face-mounted motors. Shaft extension dimensions for NEMA type P vertical solid shaft AC motors. NPSH charts for centrifugal hot water pumps, single and double suction. Revisions in the test code for centrifugal pumps. Calculation of volumetric efficiency of reciprocating pumps, using compressibility factors for water and for hydrocarbons.

Send requests to Hydraulic Institute, 122 E. 42nd Street, New York 17, N.Y.

Know your "peripheral" subjects

The present day manager of engineering who is interested in attaining a leading position for his firm "must use techniques that extend far beyond those found in the discipline of engineering", said C. F. Savage of GE to the AIEE, Middle-Eastern District meeting.

The engineering manager, he said, must develop "a delicate and sensitive sense of balancing" between the technical and non-technical aspects of his job. By becoming well rounded and knowledgeable in several fields, he will "produce a professional climate conducive and, in some instances, necessary for more effective work."

Savage listed a number of specific problems on which the manager can employ knowledge gained from the fields of political science, economics, and psychology. Included were questions of salary, educational opportunities for employees, ethics, trade secrets, patents, employment security, professional and technical societies, honors and awards, corporate practice and community responsibilities.

Industry wastes water AIChE hears

"Industry is wasteful in its use of water resources, and over the years has become accustomed to equating industrial development potential with a plentiful water supply." These were the remarks of W. H. McConnell and K. S. Lewis of Diamond Alkali Company before the 40th Annual Meeting of the American Institute of Chemical Engineers in Kansas City, Mo.

Use of water for industrial purposes has been inefficient to the extent that more than the minimum requirement (for running a plant) has been used. Better process design aimed at a more efficient use of available water will evolve as the need develops.

Sometimes air cooling instead of evaporative cooling can be used. A few companies in Texas have used treated sewage for cooling purposes. The problem of water shortage can at least be minimized by measures such as these.

Unionism: a threat to engineers

A "great stumbling block" in the way of young engineers is the threat of unionism, according to Nathan W. Dougherty, Dean Emeritus of Engineering at the University of Tennessee before a meeting of the American Society of Civil Engineers at Cleveland.

The threat of unionism is not prevalent in small organizations, but it is ever before the larger employer and his employees.

"If the climate is good in industry, where engineering employees understand the problems of the industry, the efforts to organize engineers into bargaining groups will fail of its own lack of takers," said Dean Dougherty.

There is no longer a place for the "bull of the woods" type of supervision in industry. Rather, like a good teacher, he must be a leader and not a driver.

The educator said that professionalism in engineering or any profession, is a way of thinking and living rather than an accumulation of knowledge and power.

"Knowledge and power are exceedingly important," he added, "but professionalism has to do with their use rather than to be identified with them."

"Barnes, this woman's collecting for the variety club . . ."

"Runaway" reactor dangers told

"What would happen in the case of a 'runaway' nuclear reactor, in which an 'incident' in the production of nuclear power might threaten lives and property," was the subject of discussion by Norman R. Zabel, Poulter Laboratory, at the American Society of Civil Engineers meeting in Cleveland.

In case of a runaway reactor, a control rod could be a very impressive projectile. If the energy released in the reactor excursion should succeed in expelling a rod or similar missile, the outer vapor container of the reactor would be threatened.

Protection

Adequate protection from such a threat depends upon the vulnerability of the steel shell constituting a vapor container.

Missiles having a wide range of sizes were employed in the study to determine requirements for penetrating steel plate.

Targets of hot-rolled steel were clamped between two steel frames which provided rigid boundaries for the target area. The assembly of frames and target was mounted tightly against a braced steel plate one inch thick.

Steel Quality Important

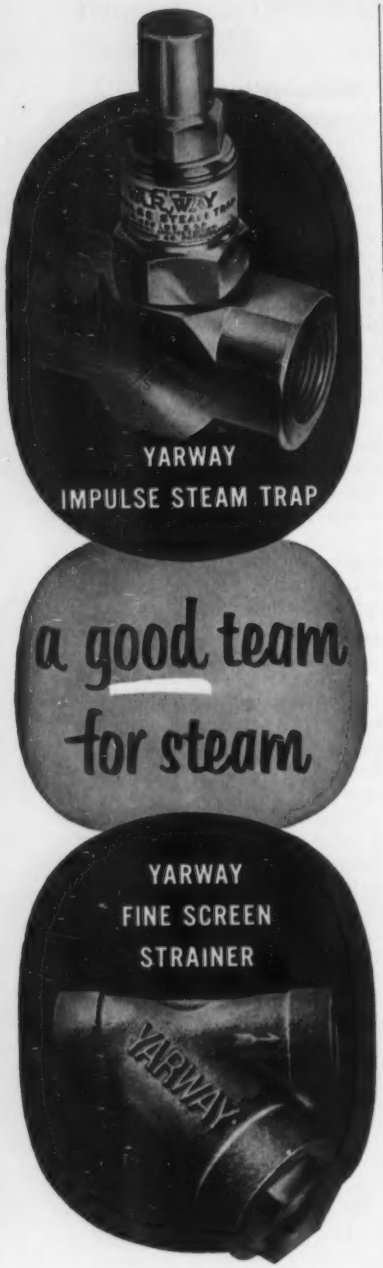
In a summary of what can be done to prevent damage of a "runaway" reactor, Mr. Zabel said:

1) "Quality of steel is important in providing defense against penetration.

2) "Kinetic energy per unit diameter is the important factor linking velocity, mass and size.

Resistance to penetration by ordinary mild steel is proportional to tensile strength.

3) "Grain structure of steel has important effects on its resistance to impact. Design of optimum missile shield for a reactor will require recognition of each of these factors."



This Yarway team has scored high—over a million installed on all types of steam equipment. Stocked and sold by 270 Industrial Distributors. For free Steam Trap Book, write YARNALL-WARING CO., 100 Mermaid Ave., Philadelphia 18, Pa.

YARWAY
with confidence

9280 inside back cover.

LETTERS

Your views are welcome in this column. Address "Letters, Plant and Power Services Engineer, 111 East Delaware Place, Chicago 11, Ill." Letters should be brief and confined to the editorial of this magazine or other topics of interest to the plant and power services functions.

A solution?

We are particularly interested in obtaining information on the flexible plastic paint mentioned in your article, "Stops Condensation in Water Treatment Plant", in the May issue (page 11).

We have been unable to find any paint that would not check due to the expansion and contraction of our insulation.

W. A. BRUGGER
Manager
ENGINEERING & MAINTENANCE
The Goodyear Tire & Rubber Co.
Houston Synthetic Rubber Plant

• *The flexible plastic paint used in the Metropolitan Edison Company's water treatment plant is a product called "Armaflex Finish" manufactured by Armstrong Cork Company, Lancaster, Pa.*

—The Editors

Have any laws?

Perhaps this is not a nomograph, and perhaps it has been printed before. Someone will have read it, I'm sure.

MURPHY'S LAW*

When considering electrical transmission systems (or any other system for that matter: mechanical, hydraulic, pneumatic, etc.), it's important to bear in mind laws set down by a legendary Mr. Murphy:

- **If it can fail, it will.**
- **If it fails, it will be at the worst possible time and place.**
- **If it can be hooked up wrong (or connected wrong), someone will do it that way.**
- **If it can be operated incorrectly, someone will operate it that way.**

In power plant work — what "Murphy" says is true. We should be prepared, and we should take as much preventive action as is practical.

**Said to have originated in the Navy.*

R. E. GUNTER
Muskogee, Okla.

• *We are very happy to receive "Murphy's Law" from reader Gunter. It made us remember that there are a lot of similar laws around. Perhaps our readers remember them too.*

If you have one, how about sending it along? We might get a good thing going.

— The Editors

Wants more info

I am very much interested in the article published July, 1959, "Uses HTHW for Heating and Cooling too."

Is there any more information available on this system such as: flow diagrams or heat balance diagrams?

J. O. EGLESTON
Gen'l Foreman over Utilities
Uranium Division
Mallinckrodt Chemical Works

• *Reader Egleston's request has been sent to Carrier Corp., manufacturer of air conditioning equipment mentioned in the story.*

— The Editors

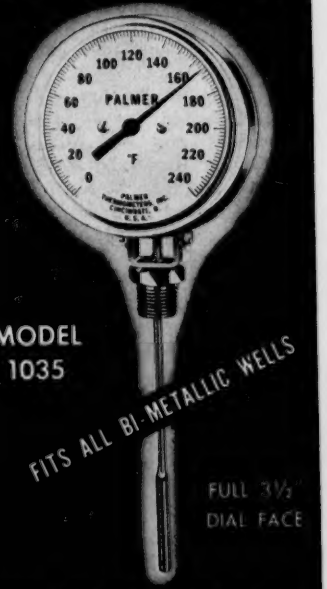
PLANT and POWER SERVICES ENGINEER

"How do you spell 'corrosion'?"

Outstanding Accuracy

PALMER

Dial Thermometer



Check these functional features

- Direct-drive Bourdon Coil with a filled system for longer lasting accuracy
- Stem can be placed at any desired angle and case can be rotated to most readable position
- External calibration for zero setting
- Unaffected by stem alignment
- Accurate to one scale division
- No sticking at any temperature
- Non-corrosive case

PALMER

THERMOMETERS, INC.

Mfrs. of Industrial Laboratory, Recording and Dial Thermometers

2515 Norwood Ave., Cincinnati 12, O.

Circle 9281 inside back cover.

AUGUST, 1959
VOL. 1 NO. 4
Plant-Power Services Engineer

Having trouble with bearing wear and burn-out?

Non-Soap Grease Resists High Heat and Water

This multi-purpose lubricant with organic thickener doesn't wash out or harden on hot well pump or stoker drive-shaft bearings

H. A. COUNTRYMAN, Editor
with engineers of Continental Motors Corp.
Muskegon, Mich.

Although exposed to high temperature, stoker drive shaft bearings get proper lubrication with heat stable grease

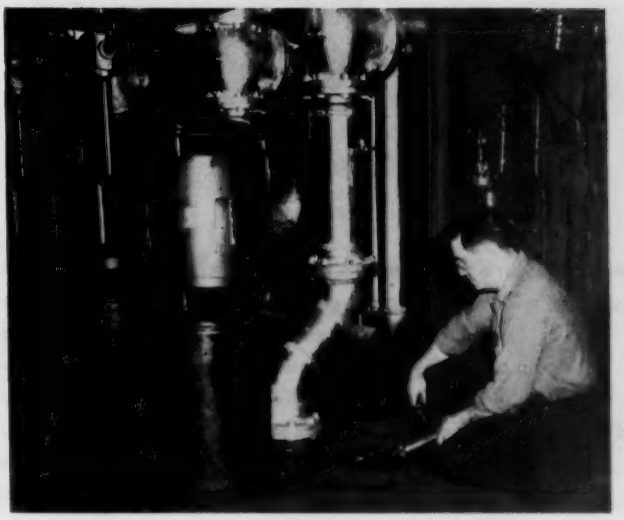
"Living" with excessive bearing wear was pretty costly in the power house of the Continental Motors' Market Street plant, Muskegon, Mich. Wherever bearings were operated under conditions of high heat or moisture they wore rapidly, and had to be replaced with frequent regularity. Conventional greases with metal soap thickeners just wouldn't give the proper lubrication.

Lower bearings in the plant's hot-well pump operate continually under water at around 150°F. Ordinary grease would soften and float out from these bearings, often during the gun application.

Improperly lubricated bearings had to be replaced and maintained continually. About a year and a half ago the plant switched to a grease with a special organic thickener. Since then there has been no bearing trouble of any kind, no evidence of unusual bearing wear.

Need for lubrication is less frequent, much less grease is used.

Experience with the hot well pump bearings led to use of the grease on other bearings operating under high heat conditions. A serious problem of burn-out of stoker driveshaft was solved by changing the type of bearing and by using grease with stability at high temperature. On these bearings and on induced draft and forced draft fan bearings, the new type lubricant does not run out on application, nor harden under high heat service. As with the hot well pump bearings, amount of needed lubricant and frequency of lubrication are greatly reduced.



Extreme wear of hot well pump lower bearings is stopped by change to water and heat resistant grease. Bearings operate in 150°F water

Multi-purpose grease is exceptionally stable both chemically and physically because of the unusual composition of the gelling agent thickener, an organic compound, the same as the oil. It is especially useful in difficult applications where extreme heat or excess moisture conditions are present. Grease line includes products ranging from a fluid consistency to a No. 3 grade, plus E. P. grades.

Performance of the grease with organic-type thickeners on high heat and water washout services has led the Continental Motors power plant to standardize on it for all lubrication. Grease inventory and inventory costs have been reduced. There is now no chance of lubrication failure due to the wrong grease being used.

(Rykon grease is a product of the Standard Oil Co. (Indiana), Dept. P&PSE, Chicago 80, Illinois.)
Circle 9282 inside back cover.

What you should know about Federal and State activities in . . .

AIR POLLUTION

ARTHUR C. STERN
Chief, Air Pollution Engineering Research
Robert A. Taft Sanitary Engineering Center
U.S. Department of Health, Education, and Welfare
Public Health Service

Public pressure for cleaner air is growing. And as it increases, industry, which has made great strides in air pollution abatement, will still receive the majority of attacks.

Within the last year, we have seen and heard numerous reports about air pollution's effect on health and property. Armed with these reports, public opinion is forcing local and state governments to pass and enforce stricter laws. There has even been talk about the Federal Government becoming a more active legislative participant.

The Federal Government has clearly stated that air pollution control is a state and local responsibility, but that it will work with these governments, industry and the public to overcome the problems.

The editors of PLANT and POWER SERVICES ENGINEER asked Arthur C. Stern, who is in charge of the Federal Government's Air Pollution Research Program, to give its readers an informative report on what the Federal and State governments are doing . . . and what we can expect from them in the future. As a plant and power service engineer, it is your duty to keep up with these activities.

—The Editors

Although municipalities have been engaged in air pollution control for many years, the entry into the field of county and state government is of fairly recent origin. County activity preceded that of state by several years.

The Federal Government is not an air pollution control agency. Congress, in passing the original Air Pollution Research and Technical Assistance Act (Public Law 159 — 84th Congress) in 1955 has stated clearly that air pollution control is a state and local responsibility.

As the name of the Act indicates, the primary role of the several Federal agencies involved is to support and undertake research into the cause, effects and cure of air pollution.

The secondary role is to make both this new knowledge and accumulated prior know-how available to state and local government, industry and the public by means of direct technical assistance through consultation or joint projects, information dissemination through publication, and the training of personnel through the support of schools and establishment of training courses.

The Air Pollution Research and Technical Assistance Act charges the Public Health Service with the responsibility for marshalling resources within and without Federal Government in this effort. Appropriations are made directly to the Public Health Service which then, by interagency agreements, makes air pollution research funds available to other federal agencies (specifically, the Weather Bureau, Bureau of Mines, Bureau of Standards, Department of Agriculture, Library of Congress, and Tennessee Valley Authority) and by National Institute of Health research grants to universities and other nongovernmental research institutes.

In addition, the Public Health Service supports an appreciable air pollution research effort by contract with both profit and nonprofit research groups having special competence and in its own research laboratories, specifically, the Robert A. Taft Sanitary Engineering Center and the Occupational Health Field Headquarters, both in Cincinnati, and the National Cancer Institute in Bethesda, Md.

Ten universities throughout the nation are currently receiving support for the development and conduct of training programs in air pollution technology. A number of qualified persons have received fellowships to allow them to avail themselves of this training.

Several of the official air pollution control agencies have nominated staff members for these fellowships. However, most official agencies and industrial organizations cannot spare personnel for the year or two required for university training.

To fill the need for one or two week intensive short courses, the Public Health Service has created an Air Pollution Training Section at the Sanitary Engineering Center, which has over the past several years carried the main burden for the nation of both in-house and field air pollution training.

Air Sampling

The air pollution activity which has most caught the public fancy is the National Air Sampling Network, a voluntary activity of 235 communities which take local 24-hour air samples biweekly and send them to the Sanitary Engineering Center for analysis. For those interested in the levels of pollution found in the air of American cities, reference should be made to "Air Pollution Measurements of the National Air Sampling Network: 1953-1957," which is obtainable either free at your local library or, for $2.00, from the Superintendent of Documents, Government Printing Office, Washing-

LEGISLATION

ton, District of Columbia.

For the immediate future, the research areas of greatest emphasis are: 1) the effect of air pollution on health, 2) the effect of automobile exhaust on smog, 3) the control of automobile exhaust, and 4) *the removal of SO_2 from flue gases.*

Local and State

As stated before, municipal, county and state governments are engaged in air pollution control activities. The most noteworthy county air pollution control agencies now in operation are those of Los Angeles, Orange, Riverside, San Bernardino and San Diego counties in California; Polk County in Florida, Jefferson County in Kentucky; Allegheny County in Pennsylvania, and Milwaukee County in Wisconsin.

In each of these states, enabling legislation had to be adopted first to allow counties to supersede their constituent cities in this regard.

In California, not only have individual counties availed themselves of this, but also a group of six counties in the San Francisco Bay area have formed the first multi-county air pollution control agency, if one does not consider the New York City Department of Air Pollution Control to be multi-county even though it encompasses the five counties making up New York City.

State Legislation

It is almost impossible to be up to date with regard to state air pollution legislation. Things are moving so rapidly in this field that during the time interval between the writing of a status report and its publication, additional pertinent legislation may well have been adopted.

Even as this report is being written, hearings and debate on state air pollution legislation are under way in California, Illinois, Massachusetts, Michigan, Pennsylvania, and Rhode Island.

Therefore, at the risk of its soon becoming obsolete, the accompanying table is presented to give a quick rundown on air pollution control activities in various states.

In the states not listed (and in some of those on the list as well), local air pollution control is accomplished primarily by use of authority delegated to cities to control public health nuisances.

Since it is the most recent major state air pollution law and incorporates rather comprehensive features, the main provisions of the Tennessee Air Pollution Control Act are worth noting.

They are:

- Air pollution is given an all-inclusive definition.
- The creation, and implementation by personnel and funds, of a State Air Pollution Control Service is authorized.
- This Service is authorized to:

"Advise, consult, and cooperate within the limitations of this Act with other state agencies, political subdivisions, industries, the Federal Government, and other affected agencies or groups in matters relating to air pollution;

"Collect and disseminate information relative to air pollution prevention and control;

"Encourage and conduct studies, investigations, and research on air pollution;

"Encourage local agencies to handle air pollution problems to the greatest extent that their resources permit; and

"Provide technical assistance and cooperation to local and regional control programs."

- The right of entry for inspection is stipulated.
- The Service is authorized to require persons to supply information (on other than secret processes).
- Municipal or county ordinances or regulations not inconsistent with the Act are neither superseded nor precluded.
- Local subdivisions are empowered to "enter into a contract, compact or mutual agreement with another political subdivision for joint use of personnel, funds, or other resources for the control of air pollution within the jurisdiction of the contracting subdivisions."

This Act is not of the type that allows or requires the state agency to promulgate and enforce state-wide regulations, applicable to those areas of the state without local control.

For an example of this type of legislation, one should study that of New York State (Chapter 931, New York Laws 1957).

AIR POLLUTION LEGISLATION IN VARIOUS STATES

	Type of Legislation			
State	Control	Local option	Research & Tech. Assist.	Other
California		X	X	
Colorado	*X			
Connecticut				X
Delaware	X			
D.C.	X			
Florida	X	X		
Hawaii	X			
Idaho	X			
Illinois				X
Iowa				X
Kentucky		X		
Maryland				X
Massachusetts	X			
Minnesota	*X			
Missouri		*X		
Montana				X
Nevada		X		
New Hampshire				X
New Jersey	X			
New York	X			
North Carolina		*X		
Ohio			X	
Oregon	X			
Pennsylvania		*X		
Rhode Island		*X		
South Carolina				X
Tennessee			X	
Utah				X
Washington		*X		
Wisconsin		X		X
TOTALS	11	10	3	9

*limited coverage

1) *Control* type air pollution legislation involves, among other things, the promulgation of rules and regulations and enforcement of same by the agency so designated. Such legislation generally permits the conduct of research, technical assistance and information activities.

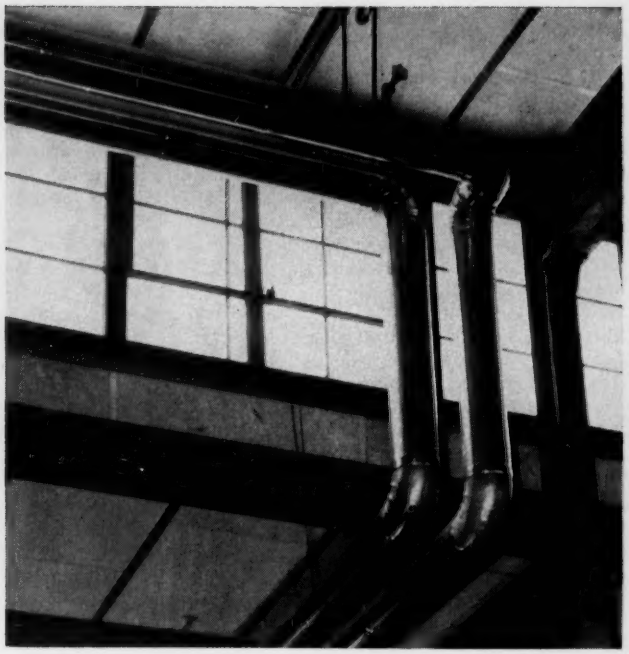
Local option type air pollution legislation enables the enactment by local communities and/or counties in accordance with terms of the Statute.

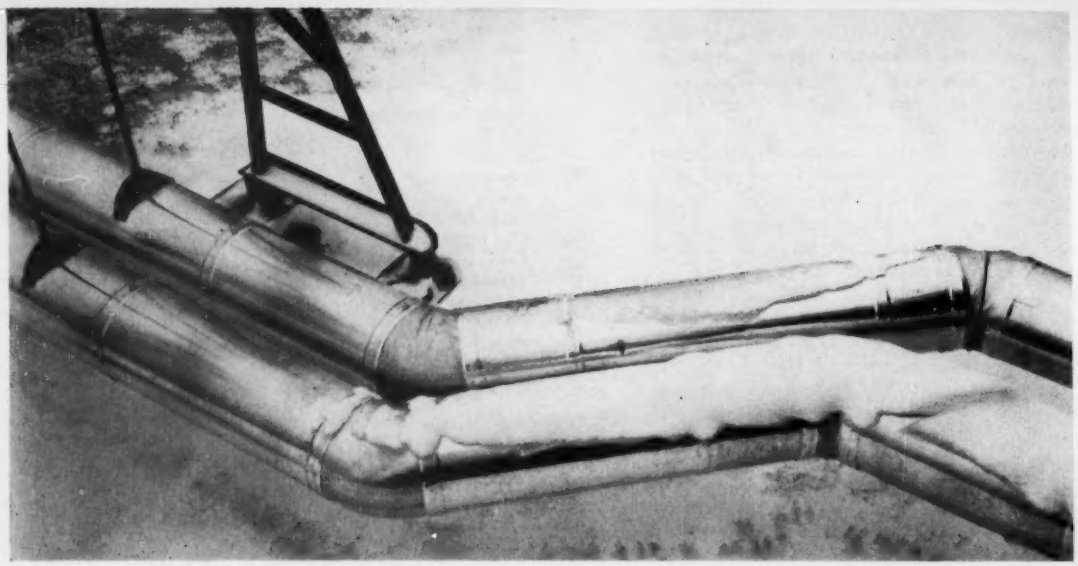
Research and Technical Assistance type air pollution legislation limits State program activities, among other things, to the conduct of research, technical assistance, and dissemination of information.

Other includes those statutes which deal with air pollution in a very limited or incidental manner. Statutes relating to rapid tax amortization, study commissions, are included in this category.

from carton to pipe in 90 seconds . . .

Insulation with built- cuts installation





Besides offering excellent insulation properties and easier installation, the aluminum-jacketed insulation gives a smooth, neat appearance. Fittings, such as elbows, present no problem

Calcium silicate insulation with built-on aluminum jacketing dramatically demonstrates its insulating properties in a section of high-temperature hot water piping on the roof of one of the Behr-Manning plants. The snow is not melting!

on aluminum jacketing time considerably

TOM McMAHON, Service Engineer
and **DICK CLARKE,** Manager of Staff Engineering
Behr-Manning Company, Troy, N.Y.
with **PLANT and POWER SERVICES ENGINEER**

LAST fall, a unique concept in insulation was introduced to industry. It was a two-in-one product that combines the pipe insulation and outer protective covering in one unit.

One of the first installations to give the product a try was Behr-Manning Company, producer of coated abrasives and pressure-sensitive tapes, Troy, New York. The company found that they were able to realize a number of cost and installation savings by eliminating the time and cost of separate application of the outer aluminum jacket.

The pipe insulation itself is a calcium silicate insulation with a low "K" factor. It is recommended for use against temperatures up to 1200°F.

The factory-applied jacketing is a light-weight aluminum alloy selected for corrosion resistance. By applying the jacket at the factory, the expense of a separate jacketing job is eliminated.

Factory application of the jacketing also provides a built-in, properly designed moisture barrier between jacketing and insulation. It thereby keeps the insulation dry during installation and avoids electrolytic corrosion of the aluminum through direct contact with wet insulation as so often happens when the jacket is installed separately.

One of the main jobs the insulation is handling is service on the high-temperature hot water lines throughout the plant. It was one of the fastest and smoothest installations Behr-Manning engineers had encountered in all their experience. They were impressed by the cleanliness of the work and by the fact that the pipe could be hosed down without damage.

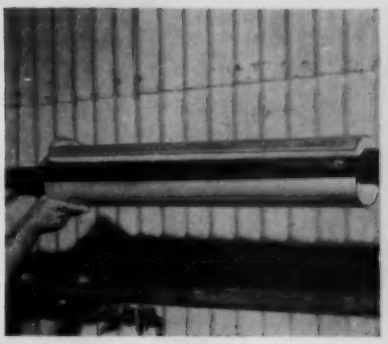
In addition, there are maintenance savings. The weatherproof aluminum alloy won't rust and is impervious to surface dirt, oils, and industrial grime. And it never needs painting.

The insulation is available in 36" sections in a complete range of sizes up to 24" pipe sizes by 3" thickness. A section snaps on the pipe and as a result of a special locking device locks tightly in place to seal out weather and protect insulation indefinitely. Joints are sealed with aluminum "snap straps" fastened in place with conventional metal bands. No sheet metal screws are used.

(Metal-On Pipe Insulation is a product of Johns-Manville, Dept. P&PSE, 22 East 40th St., New York, N.Y.)
Circle 9283 inside back cover.

How the aluminum-jacketed insulation is installed

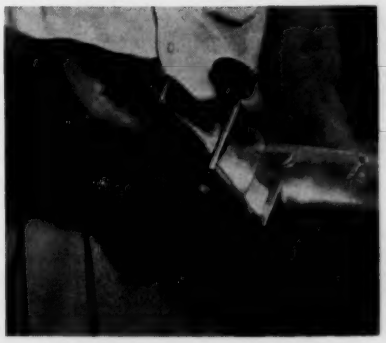
Coming in 36" lengths, the insulation can be cut right on the job. Here, a standard band saw is being used



In 25 seconds, insulation and jacketing in one movement are "snapped" onto pipe . . .

. . . 15 seconds later aluminum "snap strap" containing special barrier seal has been strapped around joint . . .

. . . ordinary metal band is mechanically applied to hold strap tightly in place. Total elapsed time is 90 seconds from carton to finish



Quick cut-outs around pipe supports, hangers, etc. are readily made with portable saber saw

COAL SAMPLING at HICKLING Optimum

Automatic unit takes accurate samples for analysis and purchase of fuel on price-per-million-Btu basis

In order to get a good representative coal sample — and yet eliminate 32 of the usual 34 hand-sampling steps — Hickling Station employs an automatic crusher-sampler which is hand fed by operator. (Unit can be tied into conveyor equipment.) Collected sample is then ready for lab tests

In 1956 the price and lesser availability of presized anthracite coal brought about a change to bituminous at Hickling Station of N. Y. State Electric and Gas. Method of coal purchase was also changed to a delivered price-per-Btu basis. Accurate sampling and analysis of all coal received from the single supplier became an important operation.

When operating at capacity, Hickling station uses an average of 42 tons an hour, or 50 to 60 truckloads a day, of bituminous coal. The average coal pile supply is 30 to 40 thousand tons. With the large expenditure for bituminous coal and to be perfectly fair to both buyer and seller, proper sampling must be employed.

Samples must be properly processed before being transported to an outside laboratory where the Btu determination is made. Based on the result of the analysis, the cost per ton to be paid to the seller is determined.

To check the quality of the bituminous coal, Hickling installed an automatic crusher-sampler similar to those in use at other NYSE&G stations.

If the samples were processed by hand, excessive man and production time would have had to be expended on the 34 necessary hand-sampling steps.

The unit at Hickling eliminates 32 of these 34 hand-sampling steps and crushes the three inch and smaller coal to sizes of six mesh and finer with a large percentage of 20 mesh or less. It automatically chooses a truly representative sample of all coal and foreign material passed to it.

It avoids the tendency of hand-sampling laborers to throw out slate, rock and other hard-to-crush substances, thus making the sample inaccurate, and, in effect, defeating the purpose of the sampling operation. Running at 160 rpm on three horsepower, it crushes about a ton a day at the Hickling station. Coal is hand introduced to the sampler from the truck shipments.

The crusher-sampler is equipped with a second splitter, which means that, of the soft coal fed it, a ten percent sample is ejected into the splitter, which, in turn, samples ten percent of the initial sample. All remaining bituminous coal which is fed into the unit is returned to the mainstream for belt conveying to the boilers.

Of the small, accurate, heterogeneous samples taken each day, accurate laboratory tests are made. Test figures on the samples apply to all coal delivered and adjustments in coal costs are made as a result of the information received in the laboratory.

All moving parts in the sampler are accessible within a minute's time. The wearing

STATION assures Kilowatt Output

parts — the crushing nut and side and top crushing liners — can be replaced easily and inexpensively. Simply by unfastening one bolt, the entire outer casing can be opened, and all interior parts exposed. This is especially important in routine maintenance.

The station can, if desired, adjust the discharge of the coal by interchanging sample spouts. Thus, a five, ten or fifteen percent sample can be taken and either immediately ejected or transferred to the second splitter spout.

A handwheel adjustment at the bottom of the crusher allows finer or coarser grinding. A counterclockwise turn opens the grinding members for coarser samples; clockwise closes them for finer pulverization. The grinding nuts are self-centering and operate without striking the liners.

For maintenance of the unit, Hickling employees have found that simple greasing or lubrication is sufficient. The top bearing is lubricated with #2 or #3 cup grease and the fitting of the pinion bearing is lubricated with #2 or #3 ball bearing grease. Gears are lubricated with medium heavy gear grease applied easily with a brush.

(Coal crusher and sampler is a product of Sturtevant Mill Co., Dept. P&PSE, 1 Harrison Square, Boston 22, Mass.) Circle 9284 inside back cover.

At the Hickling Station, coal is delivered by truck directly to coal hoppers. Samples are collected directly from the shipment

POWER PLANT & POWER SERVICES INDUSTRY . . . has grown into

Plant and Power Services Engineer

LAST YEAR, we placed the words "Plant and Power Services" inside our magazine's name to tell you, our readers, that this magazine devotes its editorial efforts solely and completely to serving you key engineers responsible for these activities. . .

. . . whether you're in one of the many industries — no matter what or how many products your company makes — in utilities, in large public and private institutions, schools, hospitals, etc., or in a consulting capacity alone.

As an engineer responsible for these plant and power services, your scope of operation is not bound or limited by any one industry. The products and services needed to create and maintain the environment and provide the facilities necessary for effective operation of your particular industry are identical with — or closely related to — the products and services needed to run your neighbor's plant . . . or that plant on the other side of town . . . or that big utility nearby.

And . . .

. . . as you know, there is no logical separation of "plant services" and "power services." The responsibility of managing both come under your or your staff's single direction.

Because this magazine is for you, we have taken a major step toward identifying it with your job. That is why this magazine has grown into PLANT and POWER SERVICES ENGINEER!

— The Editors

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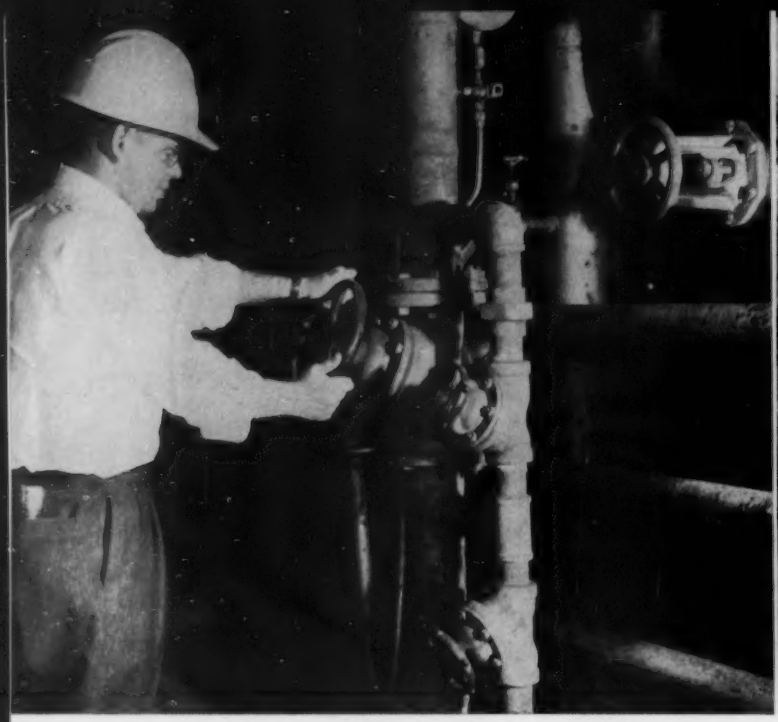


Rapid seat wear and packing leakage on ash sluicing piping is stopped by diaphragm valves.

Valves with neoprene diaphragm and disc insert eliminate leakage and plug valve wear on gas fuel line.

Diaphragm valves — cure for raw water and gas handling troubles

Utility stops excessive seat wear and leakage on low pressure services

H. A. COUNTRYMAN
Editor

with **GEORGE MILLS**
Asst. Gen'l Supt.
Venice Station
Union Electric Company

Venice station of Union Electric Company, St. Louis, was plagued with high valve maintenance and replacement costs on several of its low-pressure and low-temperature piping services.

Raw Mississippi river water, used for ash sluicing, carries a certain amount of fine sand, sediment, and grit. Conventional gate valves used on ash sluicing lines were subject to rapid disc and seat wear due to the erosive action of the raw water. Stuffing box leakage and maintenance was an added problem.

Lubricated plug valves were being used on 6" natural gas fuel lines to the boilers. They developed excessive body and plug wear, plus packing leakage.

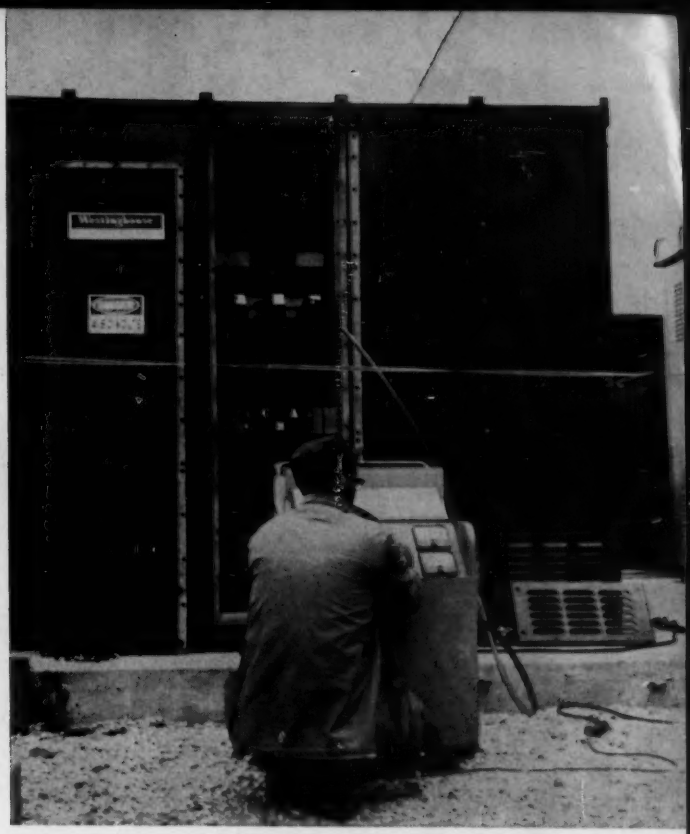
In 1951 the station began using a unique packless diaphragm valve on both of these troublesome services. The diaphragm serves only to seal the bonnet area and to eliminate need for stem packing and maintenance. These valves have a separate disc and diaphragm construction and the separate flat face disc with neoprene insert makes the closure.

On raw river water the diaphragm valves have eliminated all packing leaks. They have also cut seating wear substantially, since the neoprene insert closes more tightly and easily against fine particles in the water. Valve working parts are not exposed to the erosive effect of the dirty river water. Valve maintenance, when needed, is simpler and less costly. Any needed repairs can be made with the valve body in the line.

Because of elimination of stuffing box leakage and the all-round better performance on natural gas lines, diaphragm valves have also been used to replace lubricated plug cocks in many instances.

The Venice station's experience with large size diaphragm valves has led it to standardize on them, in ½" and ¾" sizes, for compressed air and service water lines as well.

(Diaphragm valves are manufactured by Crane Co., Dept. P&PSE, 836 S. Michigan Avenue, Chicago 5, Ill.)
Circle 9285 inside back cover.



High voltage breakdown and leakage current test on 6600 v. AC cable from substation at Gary Mill being performed with 30 kv DC mobile high voltage test set

U.S. Steel's Gary Mill uses mobile DC tester

Unit provides pre-operation testing of cables, pot-heads, substations at their working voltage

A mobile, DC, high-potential tester has been used regularly during the last nine months for pre-operation testing and electrical maintenance at the Gary Sheet and Tin Mill of U.S. Steel. The machine is designed for testing dielectric strength, high voltage insulation resistance and dielectric absorption. An average of twice-a-month tests have been made on new cables, pot-heads, new substations, suspected faulty cables, and rebuilt motors and generators.

An example of the equipment's application is a "proof test" made last summer on the cables of a new substation installation. This substation was designed to service the mill's new continuous pickle department. As shown in the accompanying layout, it is a double-ended unit made up of two sets of circuit breakers, transformers, and bus.

The substation unit will transform 13.8 kv power to 4160 volts in its final development, but at the time of the test, it was supplied by a 6600-volt line from a primary substation. The new pickle department is serviced through a secondary bus and three circuit breakers.

The curve results of the test show that all three phases of the cable displayed acceptable linear curves up to the 26 kv maximum test voltage specified by the cable manufacturer.

If, the cables, pot-heads, and bus work had been installed improperly or included defective components, the test curve would have shown higher leakage current values. The curve would have risen abruptly as maximum test voltage was approached, indicating an impending breakdown. The chances of costly cable breakdown and power failure after the substation was in service and during the operation of the pickle plant were eliminated.

Formerly, the mill tested the high potential insulation resistance of cables and machines with a 1000-volt megohmmeter. This did not stress the electrical equipment at its working voltage. The DC tester provides up to 75 kv, an adequate maximum since none of the mill's tests have required over 50 kv. In tests similar to that used at the substation, the test potential is increased in increments of 5000 volts. For testing in the range of 5000 volts or less, the steps can be limited to 1000 volt increments.

Safety is provided by a key switch that prevents operation by un-authorized personnel. The operator turns off the machine when he leaves it unattended for any reason, such as to change the phase in the unit under test.

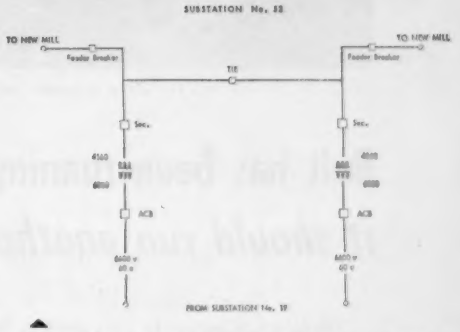
With a principle similar to that of the "dead man throttle", an operating push-button must be continuously held down to energize the tester.

Additional safety measures employed at the Gary Mill include erecting a yellow tape carrying caution signs around the test area.

Weighing under 200 lb and being equipped with push handles and rubber tired wheels, the DC unit is readily adaptable to field work.

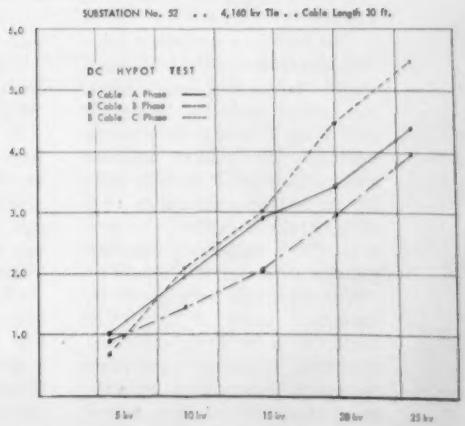
(Mobile DC Tester is development of Associated Research, Inc., Dept. P&PSE, 3758 W. Belmont Ave., Chicago, Ill.)

Circle 9286 inside back cover.



Layout for new substation to serve pickle department in Gary Sheet and Tin Mill

Test curves for three phases of cable up to 26 kv maximum



NEW SOLUTIONS

for your plant and power services problems

Is this the oldest neoprene belt in operation?

Belt has been running 21 years — *it should run another 10 or 12*

It is not a certainty that Joseph Kahn of Max Kahn's Sons, Butcher's By-Products, Poughkeepsie, N.Y., is operating the oldest neoprene belt in existence. But it is known that he purchased it in 1937.

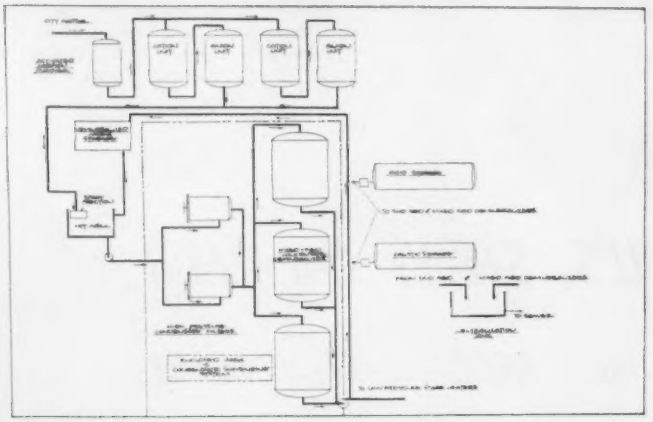
In all these years, it has never been repaired, shortened, spliced or patched. In fact, it has never been necessary even to remove it from the pulleys. Earlier belts ran only two to three years.

The belt is a neoprene frictioned-surface, 35-ounce hard duck belt of four plies, six inches wide by about 42 feet long. It is the main drive belt for the cooker agitator and runs from a 10-inch pulley on a 1700-rpm motor to a 42-inch drive pulley. Center-to-center distance between pulleys is about 20 feet.

Although the belt has been stretched until it is fairly loose, it is still in excellent condition. Exposure conditions include lubricating oil, splashes of rendered fat, and ambient temperatures up to 120° — 130°F (above the steam-heated autoclave operating at 70 psi).

It is estimated that the belt has run about 32 hours per week on a five-day schedule since it was installed 21 years ago. Mr. Kahn expects it to run for another ten or twelve years.

(Neoprene belt was purchased from New York Rubber Corporation, Dept. P&PSE, 100 Park Ave., New York 17, N. Y.)
Circle 9287 inside back cover.



Flow diagram of water treatment system for handling brackish tide-water condenser circulating water

Some new tricks in water treatment for brackish condenser water

The first large once-through Universal-Pressure boiler to serve a turbine exhausting to a condenser utilizing high-solids brackish tide-water as the condensing medium will be installed in the Charles P. Crane Station of the Baltimore Gas and Electric Company.

Because the brackish water makes the problem of leakage and "weepage" critical, the entire condensate flow will be purified by condensate scavengers — mixed-bed demineralizers with filters.

The scavenging equipment, as well as separate make-up water demineralizers will operate in series with an activated carbon filter.

Another unusual design feature is the provision being made for possible future use of ammonia in the regeneration of the mixed-bed demineralizers. Initially, the use of ammonia will be limited to its introduction into the condensate stream for pH control. This reduces the extent of preboiler corrosion and deposition of iron and copper in the boiler.

As an added precaution, ferrous tubing will be used in all feedwater heaters.

As conventionally regenerated scavengers would remove the ammonia everytime condensate passed through the system, provisions are being made so that at some future time the mixed-bed cation resin can be converted to the ammonia form.

The Crane Station will operate with turbine throttle conditions of 2400 psig and 1050°F, with reheat to 1000°F. Solids in the brackish condenser circulating water can reach values as high as 15,000 ppm TDS. The condensate purification system will consist of three demineralizers each 108″ in diameter by 10′ straight height, preceded by filters.

A neutralizing system will handle the spent acid and caustic solutions resulting during regeneration of both make-up and mixed-bed units.

(Condensate scavenger system will be supplied by Graver Water Conditioning Co., Division of Union Tank Car Company, Dept. P&PSE, 216 West 14th St., New York 11, New York.)
Circle 9288 inside back cover.

Improves heat distribution by getting 'off the floor'

Because of a problem typical in many plants — that of machinery on the floor blocking the horizontal flow of warm air — the Republic Rubber Division, Lee Tire and Rubber Company, Youngstown, Ohio, replaced all floor-mounted steam heating pipes with overhead revolving heaters.

A total of 37 overhead heaters were installed, and a comfortable, uniform heat is now obtained throughout the plant. In addition, the heaters use no floor space and are not subject to damage from floor operations and plant vehicles.

The heaters take steam at 145 psig. The delivery temperature of the air in the discharge outlet is 124°F. By the time it reaches floor level, the temperature has been reduced to a comfortable level.

The heaters are designed to use steam at any normal plant pressure from 3 to 150 psig. If the company should want to use 3 to 5 psig steam, a full set of tubes would be installed in the heater. At a higher pressure, less tubes are used to maintain same discharge temperature.

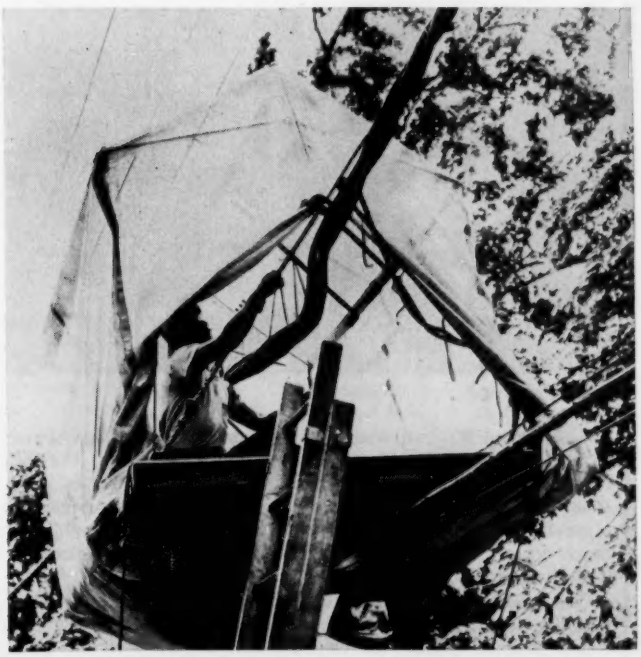
Two types of units were used in the installation: four-way and two-way revolving. Heaters use 2-hp motor to drive a fan at 850 rpm blowing room air through heating coil and out discharge outlets.

In some sections, each heater is controlled by a room thermostat. Depending upon room configuration, each heater handles between 80,000 and 100,000 cu ft of room volume.

(Revolving overhead heaters are manufactured by L. J. Wing Mfg. Co., Dept. P&PSE, Linden, N.J.)

Circle 9289 inside back cover.

Four-way revolving overhead heaters have replaced floor-mounted steam pipes to eliminate cold spots throughout plant. In some instances two-way heaters were used



Lightweight tent allows natural daylight to flood linemen's working area

Protects linemen from the weather, eliminates need for artificial light

Early in 1956, Jersey Central Power & Light Company started the search for a transparent aerial tent to protect field linemen while cable-splicing high above the ground. The idea was to provide such a shelter yet eliminate the need for artificial light.

Besides permitting ample natural light to shine through the tent, it would also have to withstand rain and wind.

The utility's search led them to a manufacturer of nylon and vinyl plastic protective coverings widely used as a maritime product. Result was a lightweight, yet tear-resistant transparent material.

Being translucent, it allows easy transmission of natural daylight to flood the linemen's working area. Similarly, at night or in stormy weather, only a spotlight at the base of the pole is needed to furnish the necessary light.

On-the-job use of the product proved it to be waterproof and unaffected by mildew and rot. This feature makes it possible for Jersey Central crews to store the aerial tent while still wet — saving much handling time and trouble.

(F-36 Clear is manufactured by Herculite Protective Fabrics, Dept. P&PSE, 125 Sussex Ave., Newark 3, N.J.)

Circle 9290 inside back cover.

Expanded vermiculite was shot from gun to cover evaporators and piping at Aruba's sea water-conversion and electric plant

Shot-from-a-gun insulation job racks up 50% saving

A unique method of applying insulation to the 35 evaporators — each 11 ft in diameter and 30 ft long — and steam piping which make up part of the sea water conversion and electric plant on Aruba in the Caribbean accounted for considerable savings and overcame problem of inadequate supply of trained men.

The technique, developed by Singmaster & Breyer, engineers, who designed and built the installation, actually "shoots" granulated insulation onto hot surfaces to give an efficient, neat coating.

It was decided to start production of fresh water before applying insulation to the hot surfaces (215°F). Applying block insulation to the cold evaporators before start-up would have delayed start-up several months because of size of job and shortage of trained labor.

Granular material is cheaper than block, and untrained workmen can be quickly taught to apply it.

A total of 80,000 lb of lightweight expanded vermiculite insulation was forced through a standard cement gun nozzle by 100-psig compressed air. Water was introduced at the nozzle tip, and the resulting mix hit the hot metal surfaces with high velocity.

There was no rebound, no steaming, and adhesion was so good that the vermiculite can now be removed only with chipping hammers. All cracks and crevices were filled.

After placement of the insulation to an average thickness of two inches, workmen troweled the surface smooth and then weathercoated it with a heavy pre-mixed black asphalt.

Singmaster & Breyer engineers say that this technique represented an estimated saving of 50% in costs compared to more conventional methods. They do not believe, however, that such a spectacular saving could be realized in the United States.

(Expanded vermiculite insulation was supplied by Johns-Manville, Dept. P&PSE, 22 East 40th St., New York 16, N.Y.)

Circle 9291 inside back cover.

Saves $1100 . . .

. . . painting 9000 square feet of plant interior. High-speed painting from an aluminum scaffold that rolled with the job reduced job cost from an original estimate of $1800 to only $630 in test of Graco spray machine at their own plant in Minneapolis, Minn. Girders over 30 ft high, impossible to reach except for the movable aluminum scaffolds, were quickly and easily painted.

(Scaffolds were manufactured by Up-Right Scaffolds, Dept. P&PSE, 10°3 Pardee, Berkeley, Calif.)

Check 9292 on Reader Service Card.

Concentrations of explosive fuel fumes in test tunnel are monitored at this remote panel

Infrared analyzers give warning when fuel fumes reach danger point

In testing the latest jet and rocket engines in wind tunnel at the U.S. Air Force's Arnold Engineering Development Center, Tullahoma, Tenn., a number of special infrared analyzers check the level of gases and fumes in the tunnel, and give instant warning when explosive conditions approach a danger point.

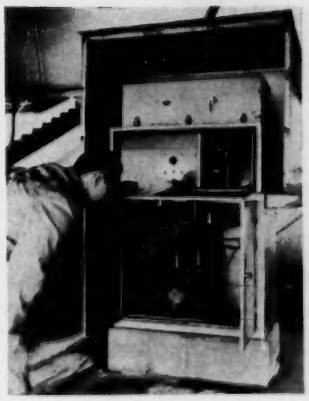
Sixteen analyzers are spotted at critical points around the tunnel. The instruments themselves are located outside. A line runs from each instrument inside the area it is checking to collect the sample. Recorders for all instruments are centrally located in the Test Control Building.

The instruments analyze a number of different fuels. These include JP fuels, kerosene, alcohol, methane, aviation gasolines and rocket fuels. They can detect the lower explosive limit for the most explosive with an accuracy of ±5%. The instruments indicate concentration with a response time of six seconds.

Vapors are analyzed under widely different environmental conditions such as temperatures from −10° to 230°F, velocities from 0 to 200 fps, and altitude pressures from sea level to more than 100,000 ft.

In operation, the analyzers continuously monitor conditions in their area. When the explosive concentration reaches 25% of the lower explosive limit, an alarm is set off. If the concentration reaches 50%, the instrument automatically initiates shutdown of fuel, reduction of power input to tunnel's compressor, and activates equipment that will flood the tunnel with nitrogen.

(Infrared analyzers are products of Perkin-Elmer Corporation, Dept. P&PSE, Norwalk, Conn.)
Circle 9293 inside back cover.



Infrared analyzers continuously check level of gases and fumes and give instant warning when explosive conditions approach a danger point

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Available with covers of copper, lead, tin, aluminum, monel, stainless steel, etc. in all sizes, standard or special.

Write for Bulletin No. 569 and prices.

CHICAGO-WILCOX MFG. CO.

7725 South Avalon Avenue
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Circle 9294 inside back cover.

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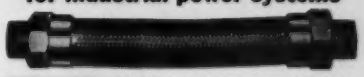

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Circle 9295 inside back cover.

NEW DEVELOPMENTS

for
effective plant and power services operation

Provides accurate control of steam pressures

Featuring an easily accessible external pilot, bolted directly to the main valve, reducing regulator is designed to provide accurate control of steam pressures for heating, process supply, and general plant use.

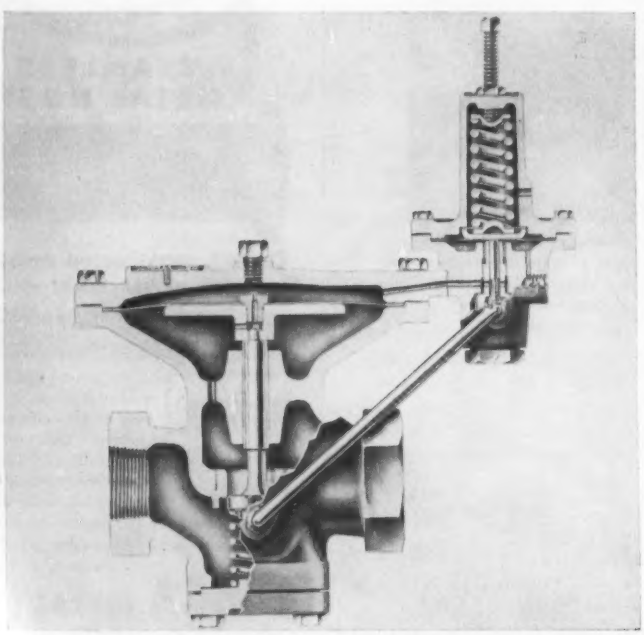
Both the pilot and the valve are made of stainless steel. Design gives fast, accurate response to pressure changes, has large capacity, and provides tight shutoff.

Relatively light in weight, compact and easy to install, regulator offers a selection of reduced pressure ranges and is adjustable over a suitably wide span.

Specifications include: iron body construction, with sizes of ¾″ through 2″, screwed connections, and ASA Class 250 flanges in sizes 2″ to 4″.

Pressure ranges are 2 to 12, 8 to 50 and 25 to 150 psig.

(Model 201-21 reducing regulator is product of Mason-Neilan, a Division of Worthington Corporation, Dept. P&PSE, Nahatan St., Norwood, Mass.) Circle 9296 inside back cover.



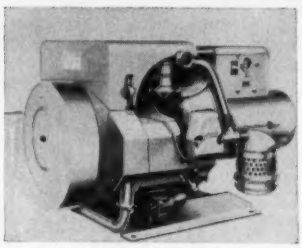
Pressure ranges are 2 to 12, 8 to 50, and 25 to 150 psig

Diesel electric plant features vacuum cooling

Units are rated 13.5 to 14 hp at 1800 rpm

Ability to be installed in completely enclosed compartments is result of design changes that have been incorporated in a 6000-watt, air-cooled diesel electric generating plant.

The efficient vacuum cooling system employs a powerful centrifugal blower that pulls cooling air through the generator and over the heated engine parts, expelling the heated air through a duct to the outside. This type of cooling permits the plant to be installed in a space just slightly larger than the unit



Cooling system allows diesel electric plant to be installed in enclosed space

and its accessories, with allowances for an air-intake vent and exhaust outlet.

Prime mover is a two-cylinder opposed, 4-cycle, full-diesel engine. A specially developed distributor fuel-injection pump provides exceptionally smooth operation of the generator set under roughest conditions.

Rated 13.5 to 14 hp at 1800 rpm, the diesel engine features removable cylinder barrels. These separate cylinders are replaceable with standard bore size (3½″ bore, 3½″ stroke) cylinders making overhaul operations simple.

The generator is rated at 6 kw AC. Single and three phase units are rated at unity power factor.

(Model 6DRN diesel electric plant is product of D. W. Onan & Sons Inc., Dept. P&PSE, 2515 University Ave., SE, Minneapolis 14, Minn.)
Circle 9297 inside back cover.

Chemically inert tape seals, lubricates pipe joints

A unfused film tape, available in 3 and 4 mil calipers, can be applied in seconds to seal and permanently lubricate pipe joints. The chemically inert Teflon tape conforms to all types of pipe threads and fittings.

Single wrapping of tape . . .

Unaffected by oil traces and other lubricants, the tape will withstand temperatures from the liquid-oxygen range through that of super-heated steam.

Although non-adhesive, the tape is sufficiently cohesive to

. . . permanently seals and lubricates all kinds of pipe joints

stick to its own glossy surface. It can be applied by one person and a single wrapping gives full protection.

Excess tape can be torn off easily. Joint lubrication is such that pipes can be loosened and detached years after the threads are taped.

("Scotch" brand Pipe Sealant Tape, No. 547, is manufactured by Minnesota Mining and Manufacturing Co., Dept. P&PSE, 900 Bush Ave., St. Paul 6, Minn.)
Circle 9298 inside back cover.

Detects cryogenics or fuels in lines or vessels

Originally developed for missile applications, sensing unit detects presence or absence of cryogenic liquids or fuels in transfer lines or vessels. Sensor is a three-part control unit consisting of a detector probe, amplifier, and connecting coaxial cable.

The probe can detect level of liquid gases and fuels within one-sixteenth inch or less and will withstand maximum pressure of 250 psi at −297°F and liquid velocity of 18 feet per second.

The amplifier operates within an ambient temperature range of 0 to 140°F.

The probe consists of a series of Teflon-spaced stainless steel concentric cylinders. When the probe is inserted in vessel or transfer line, the presence or absence of a liquid results in a change in capacitance as the liquid fills the space between the cylinders.

This measured change is transmitted by coaxial cable through an explosion-proof flexible conduit to a transistorized amplifier where it is converted to energize a double-pole, double-throw relay.

The amplifier, housed in an explosion-proof conduit box has four computer-type transistors. Coupling and impedance matching is accomplished by means of iron core transformers. Current feedback is used for stability, and temperature compensation is obtained by a thermistor circuit.

(Cryogenic Detector is product of Missile Equipment Div., Minneapolis-Honeywell Regulator Company, Dept. P&PSE, Pottstown, Pa.)

Circle 9299 inside back cover.

✦ ✦ ✦

Plastic sewer pipe needs no separate coupling and no adhesives

Made of high-density polyethylene, a hubbed sewer pipe and a hubbed perforated drain pipe eliminates need for a separate coupling. As the hubbing is an integral part of the pipe, it is easy to install, can be cut with a hand saw, and requires no special tapering tools or adhesives.

Impervious to waste acids and alkalis, the pipe will not rot, rust or corrode and will not fracture when subjected to the sort of abuse that breaks other conventional types of pipe.

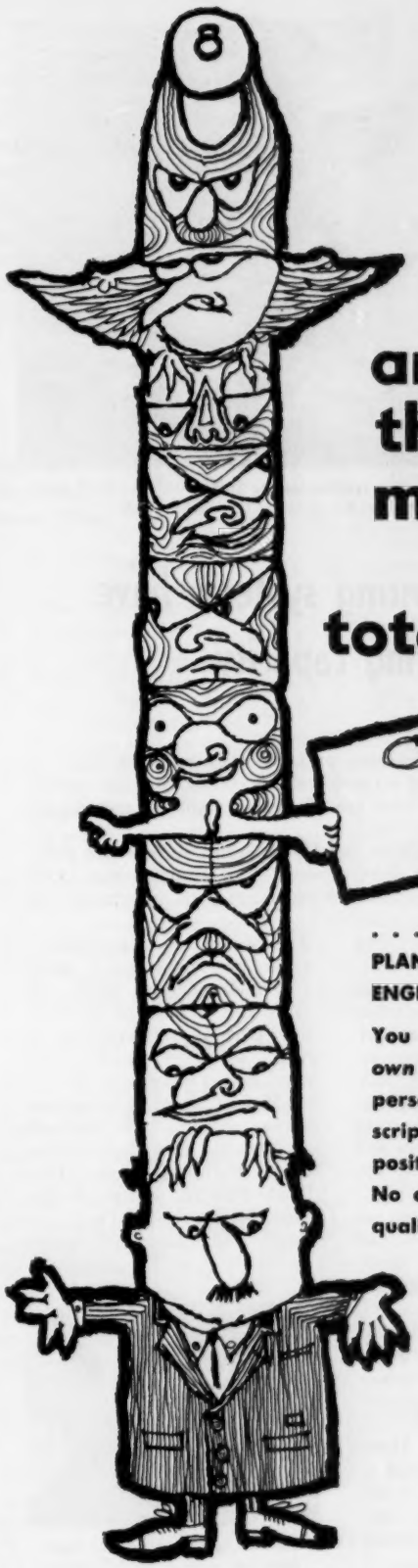
Water absorption on this plastic pipe is practically nonexistent. Its crushing strength is well over 800 pounds, with no fracture. Available, also, in double-hubbed lengths, the pipe is competitively priced with fiber pipe and other types of plastic pipe.

The hubbed sewer pipe is made in 2", 3", and 4" diameters and 10' lengths. The hubbed, slotted drain pipe is made in diameters of 2", 3", and 4". Both sewer and drain pipe can be made in 20-ft lengths, or special lengths, if desired.

(Pi-Mar S and D pipe is manufactured by Pyramid Industries, Inc., Dept. P&PSE, Erie, Pa.)

Circle 9300 inside back cover.

Hubbed polyethylene pipe requires no adhesive or separate couplings



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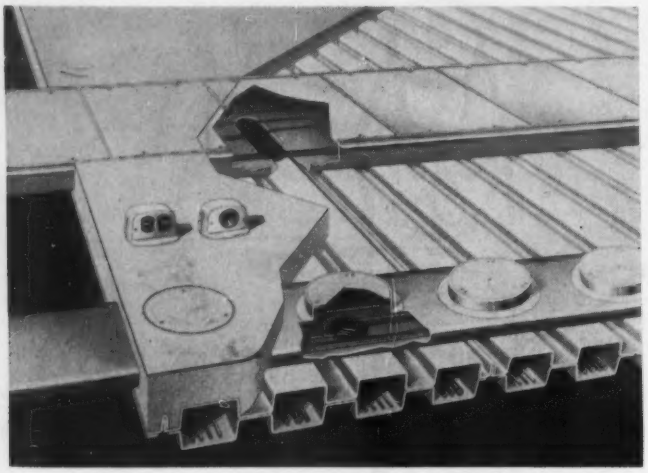
NEW DEVELOPMENTS



Two series of underfloor wiring systems feature (top) 20.294 sq in of duct capacity and (bottom) 9.2 sq in for the smaller series

Underfloor wiring systems have increased wiring capacity

Designed for applications utilizing cellular steel floors as raceways for power and communications conductors, two underfloor wiring systems make use of new designs to provide increased wiring capacity.

One of these systems — the 15,000 Series — provides a full 20.294 square inches of duct capacity. The other — the 14,000 Series — offers a 9.2 square inch capacity. Both systems can be combined in one installation by use of a special connecting device.

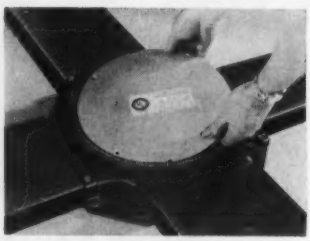
The 15,000 Series duct measures 2½ by 10 inches and is made of 14 guage steel. It has removable rib-reinforced cover plates of die-cast aluminum which are designed to butt together to form a cover for the duct and also to permit quick, easy access to the wiring.

An aluminum extrusion on either side provides a screed line for concrete and finish trim for tile. Standard lengths are 3 and 5 feet.

The 14,000 Series, made also of 14 guage steel, measures 1⅜ by 7¾ inches. It is available with junction unit spaced on centers ranging from 12 through 120 inches. These junction units are designed to permit convenient outside adjustment. The duct is furnished in 8, 9 or 10 ft standard lengths.

Also available with the 14,000 Series, a large-capacity cross box provides a large 11¼-inch opening which allows full access to all four duct exits as well as a 3 by 12 inch opening which gives good access to cells of floor.

(Headerduct underfloor wiring systems are products of National Electric Division, H. K. Porter Company, Inc., Dept. P&PSE, Porter Building, Pittsburgh 19, Pa.)
Circle 9301 inside back cover.



One wiring system features large cross box opening for full access to all four duct exits

Both heating and cooling in one roof-top unit

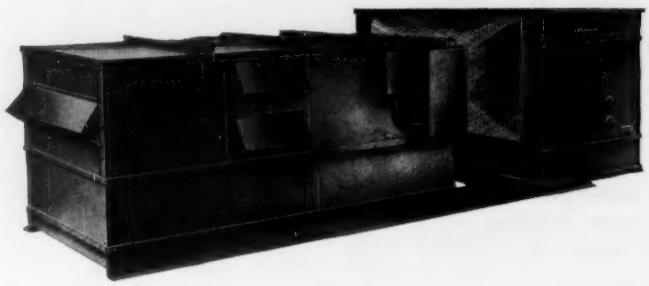
Packaged year-round air conditioners can be installed with a minimum of engineering and labor on the roof of one-story buildings. The units heat with gas, cool with electricity, and are built in two sizes—200,000 Btu per hour input heating coupled with 7½ horsepower cooling, and 250,000 Btu heating per hour linked with 10 horsepower cooling.

Factory-assembled and wired in one weatherproof cabinet, each unit is set over an opening in the ceiling and is fitted to a diffuser. Drawing return air up through the center of the diffuser, the unit discharges conditioned air down and out the sides.

No ductwork is required, and a damper controls the mixture of outside air. Single gas, electric and thermostat connections are used.

With the units, flexibility is obtained by locating them near the greatest heating-cooling load. Because there is no ductwork, the plant and power services engineer needs only to determine the heating and cooling load, decide how many units are required and where positioned.

(Roof heater-cooler is manufactured by Carrier Corp., Dept. P&PSE, Syracuse 1, N.Y.)
Circle 9302 inside back cover.



Air conditioners use no ductwork and can be located near the greatest heating-cooling load

✦ ✦ ✦

Protective glove comes in aerosol can

Coming in an aerosol package so that it can easily be sprayed on, hand protection compound is designed to keep hands clean and germ-free and to prevent dirt, grease and other grime from clogging the pores.

Proven field tests show that one application forms an invisible "protective glove" to seal out messy and possibly harmful materials.

Made with lanolin and glycerine, it comes from the aerosol in foam cream form and is rubbed right into area to be near the greatest heating-protected. At the end of the work period, when hands are washed in water, the "invisible glove" and any accumulated grease and grime are easily washed off.

An added merit is its therapeutic value — product tends to heal rough and scaly hands.

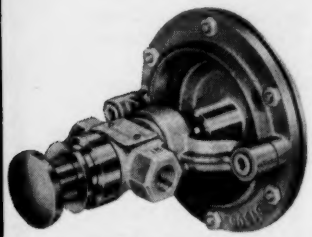
The material is available in a small aerosol can containing over 100 applications and in a larger unit containing over 225 applications. Each application lasts four hours.

("Protex-A-Hand" is a product of Acrolite Products, Inc., Dept. P&PSE, 108 Ashland Ave., West Orange, N. J.)
Circle 9303 inside back cover.

Automatically interlocks manually controlled circuits

Designed for automatic interlocking of manually controlled circuits or to permit manual operation of an automatically operated system, full line of control valves handle a variety of fluids.

Used in interlocked circuits, the valve can prevent out-of-sequence or accidental manual actuation which otherwise might result in damage to the machine, the workpiece or injury to personnel. In normally automatic circuits, the valve permits manual operation for machine set-up or for emergencies.



Various end sections and mounting styles are available

For interlocking service, a stock diaphragm end section is fitted to a standard body, with a knob, lever or other type manual control mounted on the opposite end. Manual operation of the valve is unrestricted until air is applied to the diaphragm end. Actuation of the diaphragm returns the valve and holds it in desired position.

Fitted with a return spring, the valve functions automatically, actuated by any three-way pilot valve, instrument or process control.

The valves — for use in air, oil or vacuum service — are available with 2-, 3-, or 4-way valve bodies. Piped or open-end exhausts are optional on 3- and 4-way valves, and any combination of end sections and mounting styles are available.

Port sizes range from ¼ through 1 inch NPT and flow area through the valve equals nominal pipe size.

Maximum flexibility, high bursting strength and resistance to oil are properties of the neoprene-covered synthetic fabric diaphragms. Suitable for 20 to 60 psi air actuation or 15 psi instrument pressure, the valves will handle intermittent actuation pressures up to 125 psi.

Bodies are Navy M bronze, with hard-chrome plated stainless steel stems. Molded Hycar "OU" packers are unaffected by air, oil, grease or water. For hydraulic or vacuum use, self-lubricating moly-compounded O-rings are fitted.

(Auto-manual control valves are products of Valvair Corporation, Dept. P&PSE, 454 Morgan Ave., Akron 11, Ohio.)
Circle 9304 inside back cover.

Plastic tubing handles hydraulic, pneumatic jobs to 2500 psi

Flexible, lightweight pneumatic and hydraulic tubing is a natural color polyamide formulation for permanent use in lubrication systems, instrumentation, vacuum, and air lines to equipment, tools, etc.

Two types are offered — low-pressure tubing for applications to 1500 psi, and for medium-pressure service to 2500 psi. Both are available with an OD of ⅛, 3/16, ¼, 5/16, and ⅜ inch. Wall thickness varies with intended service, OD and other factors.

Flexible tubing is designed for permanent use

Normal maximum operating temperature is 150°F.

The tubing is shipped in standard coil sizes of 500 ft contained in heat-sealed polyethylene bags to preserve moisture content.

(Synflex-N 3-tubing is available from Synflex Products Division, Samuel Moore & Company, Dept. P&PSE, Mantua, Ohio.)
Circle 9305 inside back cover.

Handles many air cleaning jobs, uses paper filter

Series of small-size dry-type air filters with replaceable paper elements are adaptable for a wide variety of applications, including use as breather filters on diesels, large air-cooled engines, or hydraulic oil reservoirs (especially reservoirs subject to high volume changes), and as air cleaners on compressors, portable power units, and other types of small air-cooled engines.

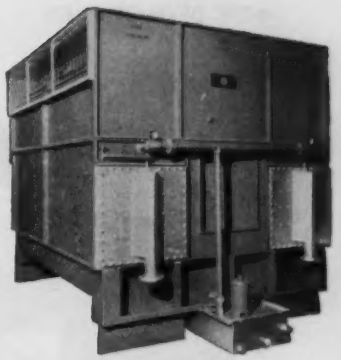
Measuring approximately 3" by 4¾", the filter consists of a replaceable resin-impregnated paper element, preformed and accordion-pleated to provide greater filtering area.

The filter will handle flows to 15 cu ft of air per minute, and removes contaminants as small as 10 microns from the air stream.

Addition of a fibrous wrap around the inside diameter of the paper element prevents oil blowback from saturating the filter medium. This greatly increases the life of the filtering element and makes the series particularly suitable for breather applications.

Differing only in size and style of outlet connection, two models are available — AF-300-7 with 1½" straight throat and the AF-300-8 with ½"-14 NPT external thread.

(AF-300 filter series is manufactured by Purolator Products, Inc., Dept. P&PSE, Rahway, N.J.)
Circle 9306 inside back cover.



Is your plant CRITICALLY SHORT of WATER?

You will make major water savings, reduce your costs, solve your problems of water supply or disposal and get HIGH OPERATIONAL EFFICIENCY with Niagara "Aero" Evaporative Heat Exchangers, After Coolers or Condensers for these important plant services or processes:

- AFTER COOLING and air drying for large air and gas compressors and AIR LIQUEFACTION
- COOLING ENGINES, COMPRESSORS, HYDRAULIC PRESSES
- COOLING QUENCH BATHS, FURNACES, INERT ATMOSPHERES
- COOLING ROLLS, WELDERS, DRAWING OR EXTRUSION DIES
- PRODUCT AND PROCESS COOLING CHEMICALS OR INTERMEDIATES
- COOLING LIQUIDS OR GASES IN CLOSED SYSTEMS
- VAPOR CONDENSING UNDER VACUUM
- ELECTRONIC PROCESS COOLING

High operational efficiency means: precise temperature for improved product and process quality control, heat removal at rate of input, simple operating conditions, real economy in upkeep, sustained full capacity.

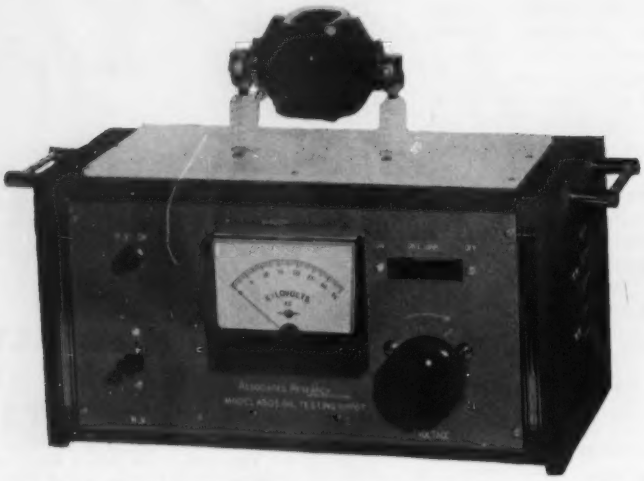
Also it means cooling in a closed system with your product kept free from contamination or, when condensing, getting a pure condensate holding high quality in your product or material.

Niagara machines do the work of a cooling tower plus shell-and-tube coolers with a single machine that saves piping, water handling disposal and treatment expense and 95% of water consumed by contact cooling methods.

Write for Bulletin 129, 130, 132, 136R.

NIAGARA BLOWER COMPANY
Over 35 years of Service in Industrial Air Engineering
Dept. PL-8, 405 Lexington Avenue
NEW YORK 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada

Circle 9307 inside back cover.



Insulating oil tester weighs 42 lb, yet provides up to 35 kv AC for voltage breakdown tests

Tests insulating oil on-the-spot

For transformers, capacitors, and bushings

High-voltage tester for insulating oils is so light in weight that it can be used for on-the-spot tests of oils in transformers, high-voltage capacitors, bushings, or oil-immersed components and power supplies.

Weighing only 42 pounds, the instrument provides up to 35 kv AC at 2 kva for voltage breakdown tests. Its size is 8½" in depth, 16" wide, and 8" high.

Measurement of test potential is made directly at the test electrodes to assure accuracy. The test set operates on 110-120v AC.

Models with built-in motor driven automatic rate-of-rise control to increase the test voltage at 3 kv per second, as required by some ASTM specifications, are also available.

(Model 4505-A insulating oil tester is available from Associated Research Inc., Dept. P&PSE, 3777 W. Belmont Ave., Chicago 13, Ill.)
Circle 9308 inside back cover.

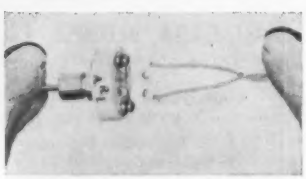
Features direct contact of thermocouple wire to lead wire

High-temperature thermocouple connector features direct contact of the thermocouple lead wire to the wire of the thermocouple. The connector is mounted on the end of the thermocouple shaft, containing swaged ceramic insulated wire, by means of a brass compression fitting. No welding is required.

The connector is available for one and two pairs of thermocouples in one shaft. It will operate to 1000°F and is reusable and easily removable.

The brass captive screws permit easy field handling. Thermocouple probes with the connector already mounted are also available.

(F-2 and F-4 thermocouple connectors are products of Aero Research Instrument Co., Dept. P&PSE, 315 N. Aberdeen St., Chicago 7, Ill.)



Either 2-post or 4-post connectors are available

For power plant automation

A series of digital transducers measure air conditioning and heating power plant variable to provide digital encoding for remote reading of flow, liquid level, pressure or temperature.

The transducers employ completely mechanical amplifier actuated directly by standard measuring elements, to position the shaft of a precision encoder (analog to digital converter).

The use of the mechanical amplifier eliminates need for electronic servos, vacuum tubes, magnetic amplifiers, or electronic components with resultant reduction in initial cost, lower maintenance cost, and an increase in reliability.

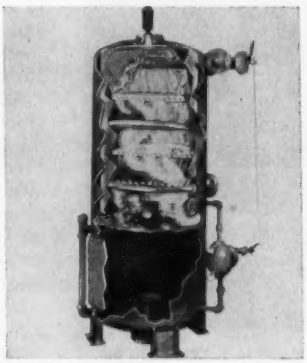
The transducers are available in vacuum and pressure ranges to 10,000 psi, temperature ranges to 600°F, and in mercury or bellows type manometers for liquid level or flow applications.

Conservatively rated with an accuracy of ± 1.0 per cent of span, the transducers have a reproducibility of better than ± 0.5 per cent of span. Linear or square root encoders are available.

(Series 400 Digital Transducers are product of Mechanical Components Dept., American Meter Company, Inc., Dept. P&PSE, P.O. Box 309, Garland, Texas.)
Circle 9309 inside back cover.

Internal vent condenser increases efficiency of feedwater heater

Available with either vertical or horizontal storage section and in capacity range from 3000 to 300,000 lb per hr, deaerating feedwater heater has an exclusive internal vent condenser.



Vertical model of feedwater heater shows vent condenser operation

The condenser is in the form of a double-walled hood at the top of the heater. A series of opposing fins on the inside walls slows and condenses the rising steam. Air and non-condensable gases escape through the air vent valve to atmosphere.

In operation, entering feedwater sprays against the underside of the hood, deflecting down in a fine mist. The mist falls onto the top baffle plate, runs down the slope and over a serrated edge onto the next baffle below.

As the water flows downward in thin streams, steam flows up, scrubbing the water and sweeping air and non-condensable gases upward through the vent condenser and out the air vent.

Only enough steam escapes to insure complete removal of air.

Countercurrent flow of steam and water insures maximum feedwater temperature with minimum steam consumption. Other features include stainless steel inner shell in deaerating section where oxygen is released, and choice of float controls to regulate feedwater inlet.

(Deaerating feedwater heater is product of Stickle Steam Specialties Co., Dept. P&PSE, 2215 Valley Ave., Indianapolis 18, Ind.)
Circle 9310 inside back cover.

Aerosol belt dressing is safer to use

Belt dressing in aerosol form, which can be sprayed on moving transmission belts, eliminates need of having workmen's hands and arms in the way of moving belts or pulleys.

To apply, the aerosol can is held 12 to 15 inches from the

Belt dressing can be sprayed on while belt is running

pulley. Spray is applied while drive is running, and the rotation of the pulley transfers the film to the inner surface of the belt.

The material can be used on V-, rubber, fabric or leather belts.

Use of the aerosol can offers several advantages. Since the dressing is applied while drive is running, there is no loss of power or production. The aerosol can permits the operator to control the amount of dressing being applied.

The spray can be directed to the very spot where it is needed, and, therefore, there is less danger of applying more dressing than the belt will absorb.

(Sprazon belt dressing is product of Graton & Knight Company, Dept. P&PSE, 342 Franklin St., Worcester 4, Massachusetts.)
Circle 9311 inside back cover.

Plant Power Services Engineer

MEMORANDUM

From: The Editors

To: The P. and P.S. Engineer* (meaning you)

Subject: Do you receive this magazine

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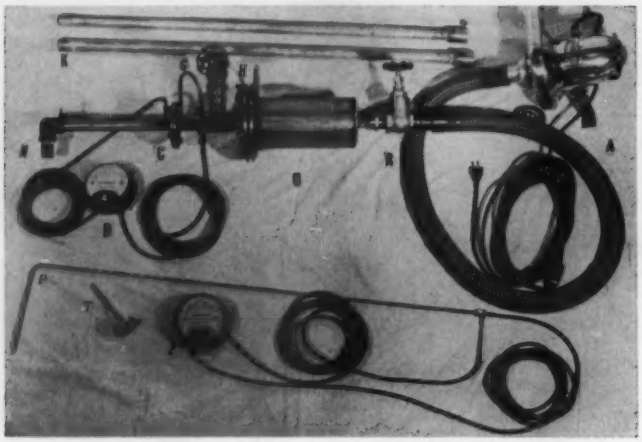
The Editors

*Power Engineer, Chief Engineer, Services Engineer, Plant Engineer, Utilities Engineer, General Engineer or whichever of the many other titles you go by as a person responsible for the plant and power services in your company.



Dust sampling unit consists of (N) sampling nozzle, (K) flow tube, (C) orifice meter, (U) filter case, and (A) exhauster unit

Easy way to measure dust or fly ash

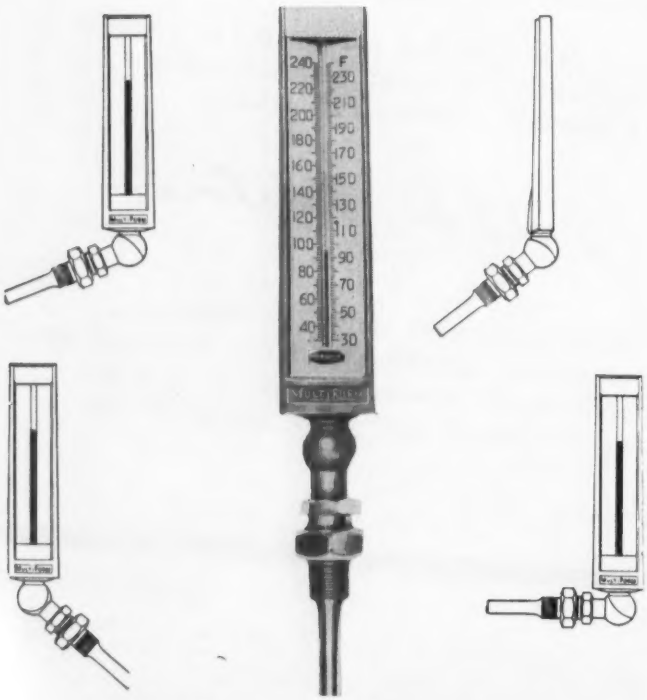
Developed primarily to measure dust or fly ash loading of boiler flue gas, portable dust sampling unit can be used to determine the solids content of any gas stream even at high temperature or in corrosive gases.

The device is a complete self-contained sampling unit with the filtering section attached directly to the sampling tube and having a separate blower. This keeps the size and weight of each low enough to be carried with one hand to allow one man to set up the unit and run a dust test with little effort.

The sampling nozzles and extension tubes are made with quick-locking connections so the unit can be quickly assembled with tube length and nozzle size needed for the particular conditions. Fabricated of stainless steel, the unit will withstand high temperatures or corrosive gases and prevent contamination of sample with rust and scale.

Other parts of the unit are: a flow tube, orifice meter, and filter case. The exhauster unit is a high-pressure centrifugal blower with universal motor.

(TE-102 Dust Sampling Unit is product of Breslove Separator Company, Dept. P&PSE, Commonwealth Building, Pittsburgh 22, Pa.)
Circle 9312 inside back cover.



Thermometer's versatility reduces inventory requirements

Industrial thermometer adjusts to any angle for best view

Versatile industrial thermometer can be turned or tilted to the most favorable reading position after the stem is in place, locking firmly in that position.

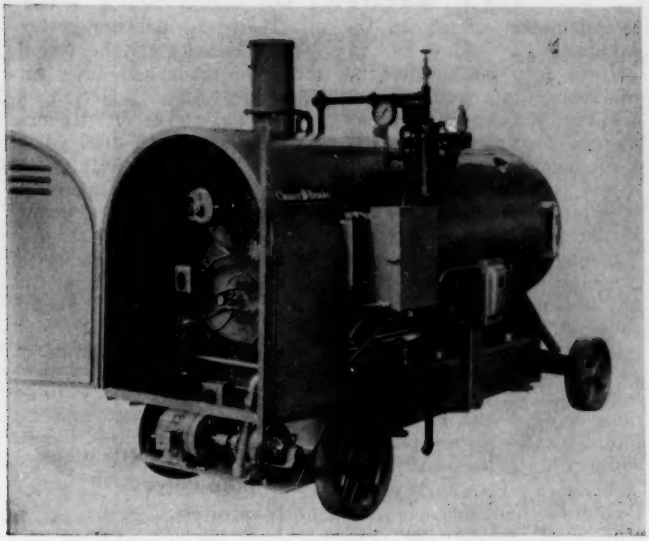
The locking device allows for speedy reset to any desired form should the thermometer have to be moved to a new location, or repositioned due to a change in piping.

This feature reduces inventory requirements, and lowers the cost of engineering and specifying thermometers in advance of actual construction.

Available with any standard SAMA separable socket or with exposed bulb and perforated stem construction for air conditioning and heating applications, the thermometer has a case of cast brass or aluminum which is protected from industrial fumes or sea atmosphere by a baked wrinkle-finish.

The tube is recessed between a two-piece scale to eliminate parallax, while the red reading-mercury tubing is seen against a baked white enamel scale.

("Princo MultiForm" is manufactured by Precision Thermometer & Instrument Company, Dept. P&PSE, 1434 Brandywine St., Philadelphia 30, Pennsylvania.)
Circle 9313 inside back cover.



Mobile boilers are available in 40 and 50 horsepower sizes.

Steam where you want it; boiler has wheels

Although primarily designed for steam cleaning or steam thawing applications, a compact mobile boiler mounted on wheels offers a unique method of producing steam in the field.

Available in 40 and 50 horsepower sizes, the units measure 15 ft long, 4 ft wide and 5½ ft high. They weigh about 5,000 lb each. The specially constructed frame with hard rubber wheels provides ease of mobility.

The 40-horsepower unit has an output of 1,380 lb of steam an hour at 212°F. The 50-horsepower boiler delivers 1,725 lb of steam an hour at 212°F.

Each is equipped with a water make-up tank which holds enough water for an hour's operation. A simple hose connection from a local water supply will normally provide water at 20 to 40 psig for continuous and automatic operation.

The units are fired with light oil, and each boiler has an oil storage tank with 80-gallon capacity. This is enough fuel for about seven to eight hours of operation.

The hard rubber tires and low carriage make towing simple and quick. Small station or yard trucks can easily pull the unit.

The fire-tube design is made for hard use with tube surfaces readily accessible for cleaning. Burner is simple and sturdy. The unit is completely weatherized for outdoor storage and use.

("Monitor Portable Boilers" are manufactured by Cleaver-Brooks Company, Dept. P&PSE, 326 Keefe Ave., Milwaukee 12, Wis.)
Circle 9314 inside back cover.

Conveyor-belt scale gives continuous record of coal consumption

Automatically weighing and recording up to 15 tph of coal, belt weigh scale provides a continuous record of consumption that is accurate to 0.25 percent.

The unit may instantaneously set to by-pass the feed chute or to resume automatic operation.

Essentially, the unit consists of a dust-tight enclosure with a 24½" square inlet, and a 200-lb hopper capacity. Feed chutes, skirt plates, the regulating plate and hopper are of stainless steel.

In the event of a power failure, the coal can be bypassed instantly from the feed chute to a gravity discharge opening, without moving or breaking the belt feeder. The feeder unit is completely isolated and there is no need for cleaning the pulleys or retraining the belt.

While in operation, the feeder may be removed from the enclosure for inspection or repair without spilling bypassed coal over the weigh hopper, dump doors, etc. Both by-passing and resetting are accomplished outside the scale enclosure. The unit is also available with larger size hoppers, and with special features such as magnetic head pulleys for tramp iron separation, right or left hand assemblies, and elongated scales.

Portable units for periodic checks on boiler efficiency are also manufactured.

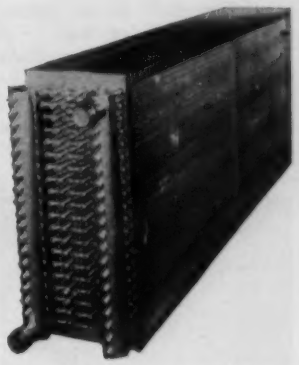
(Belt Fed Weigh Scale is manufactured by Beaumont Birch Company, Dept. P&PSE, 1505 Race St., Philadelphia 2, Pennsylvania.)
Circle 9315 inside back cover.

Water-cooling coils are easy to clean

Line of chilled water-cooling coils has been so designed that they can be easily and quickly cleaned. By being able to operate under bad water conditions, thereby, avoiding a build-up of sediments, the coils are particularly suitable for central station or zone air conditioning systems.

The aluminum fins are permanently bonded to the tubes by mechanical expansion of the tubes. The fins' embossed streamline pattern increases their surface and results in better air wash with a step-up of heat transfer by as much as 15 percent.

Secondary and primary surfaces are properly balanced for best efficiency and low air friction. Seamless copper tubing, ⅝" OD, is spaced on 1½" centers. Standard coils use in-line tubes, but staggered tubes can be furnished on special order.



Aluminum fins are permanently bonded to tubes

Galvanized casings are furnished as standard. Flanges and mounting holes are provided to simplify coil installation.

Coils are available with finned surface heights ranging from 12" to 36", in 3" multiples. Lengths range from 24" to 120" in 6" multiples.

Coils can be built with from one to eight rows, and with fins running 6, 7, 8, or 10 to the inch.

(Cleanable Water Coils are manufactured by Halstead & Mitchell, Dept. P&PSE, Bessemer Bldg., Pittsburgh 22, Pennsylvania.)
Circle 9316 inside back cover.

Gear speed reducer is rated at 200 hp — largest standard unit

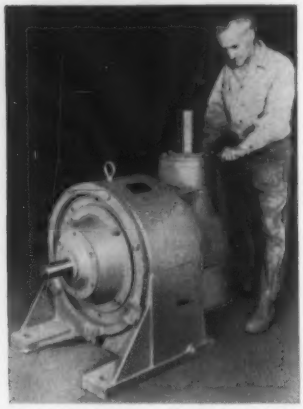
Two large-size gear speed reducers are additions to existing series of in-line drives.

Rated up to 200 hp, the units feature overall efficiencies of 94 to 97 percent, depending upon number of reductions required. Double, triple and quadruple reductions are available in AGMA ratios up to 440 to 1.

Right angle spiral bevel attachments are available for mounting in any of eight drive positions at 45° increments. *To next page*

Final stage helical gearing is carburized and hardened, and gear teeth are precision ground, giving increased load-carrying capacity, reduced vibration and noise, longer life and space savings.

Large diameter shafting and oversize bearings have sufficient reserve capacity to handle severe overhung loads and shock conditions.



Double, triple and quadruple reductions are available

Internally ribbed, cast iron housings provide maximum strength and rigidity. Mounting stability is assured by a broad housing base, which also provides a large oil reservoir.

(In-Line gear speed reducers are manufactured by Philadelphia Gear Corp., Dept. P&PSE, 3620 G Street, Philadelphia 34, Pa.)
Circle 9317 inside back cover.

Automatic engine controls feature plug-in relays

Series of automatic engine controls are encased in a steel, dust-proof cabinet and features overload breakers and plug-in relays.

While the overload breakers eliminate need for fuses, the plug-in relays simplify field maintenance.

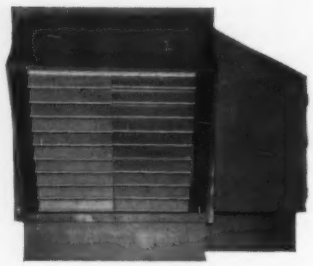
In closing the cover of the cabinet, a cushion pressure positively locks the relays in their sockets so they cannot be vibrated loose.

An engine, equipped with one of these control sets can be started or stopped from remote pilot devices such as pressure switches, float switches, and power failure relays.

(Automatic engine controls are products of Synchro-Start Products, Inc., Dept. P&PSE, 8151 N. Ridgeway, Skokie, Ill.)
Circle 9318 inside back cover.

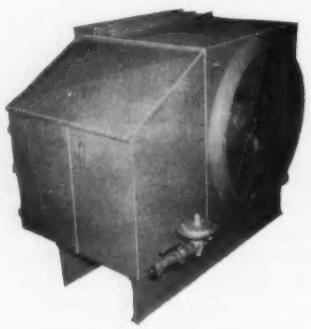
Gas-fired ventilation units have top fuel efficiency

Offering almost 100 percent combustion efficiency, line of direct-fired intake units supply tempered outside air to replace air removed by industrial exhaust systems.



Intake . . .

By burning natural or propane gas in a line-of-flame burner directly in the entering air stream, unusual economy is achieved. The products of combustion are mixed with large volumes of fresh air to eliminate any possibility of contamination of air in the building.



. . . and discharge sides of gas-fired intake units

Units may be installed on the roof or in a wall opening, and used with or without duct system for air distribution. Basic models are rated at 2, 4 and 6 million Btu per hr, with air volumes of 25, 50 and 75 thousand cfm.

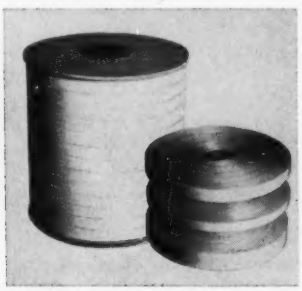
Standard models have a propeller fan mounted in the air stream — but vaneaxial, tubeaxial or centrifugal fans for external mounting can also be supplied. Accessories include an intake rain shield, filter housing with permanent filters, and motor-operated shutters.

Standard control system provides automatic operation with absolute safety for precise control of temperature rise from 10° to 85°F.

(Gas-fired intake units are manufactured by Hartzell Propeller Fan Company, Dept. P&PSE, Piqua, Ohio.)
Circle 9319 inside back cover.

Tape for transformers, coils and armatures is strong

Electrical coil banding and tying tape has unusually high tensile strength with minimum stretch. It is especially suited for liquid-filled transformers and repairing and rewinding heavy duty coils and armatures.



Tape has high tensile strength with minimum stretch

Made from unbleached, carded, warp-twist cotton yarn, the tape consists of parallel strands, bonded with special adhesive. The strands run lengthwise only.

There is no unnecessary cross weave, and the tape is free of seeds and other impurities.

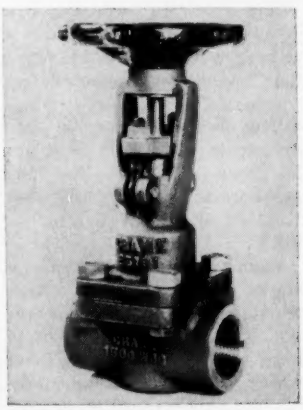
Available on traverse wound spools 250-1000 yd, or convolute wound rolls of 100 yd each, the tape performs to major transformer manufacturers' specifications.

(Tensul-Tape is product of General Printed String Co., Dept. P&PSE, 2511 S. Fourth St., Milwaukee 7, Wis.)
Circle 9320 inside back cover.

Combines plug disc globe and gate valves' advantages

Originally designed for oil field water flooding service, 1-inch valve has found application wherever corrosion and erosion are problems.

The 1-inch valve offers the combined advantages of a gate valve, a plug disc globe valve and resistance to corrosion and erosion.



Stem is pinned to disc

Features of the valve include: tapered non-turning plug disc; stem pinned to disc; hand wheel attached to yoke sleeve; screwed ends; reduced seat and fine stem threads for accurate flow control; "O" ring bonnet joint; and a rating of 1500 psi water, oil or gas working pressure.

(No. 18857 valve is manufactured by Crane Co., Dept. P&PSE, 836 S. Michigan Avenue, Chicago 5, Ill.)
Circle 9321 inside back cover.

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.....**Engineering headquarters of multiplant firm**
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.....**Other** .....
Equipment ratings:
Boilers: Number .... **Total Capacity:** ..... **lb/hr**
Total connected electric load .....**kva**
Total transformer capacity .....**kva**
Total number electric motors .... **Total hp** ....
Total number pumps ..... **Total hp** .....
Total number compressors ..... **Total hp** ....
Products manufactured .....
Signed .....
Date .....

NEW DEVELOPMENTS

Method of bussing switchboards gives more room

In an improved method of bussing switchboards, bussing is stacked vertically, rather than cross-bussed, and moved back and completely out of the wiring area.

Unobstructed working space is thus provided and wiring time is reduced.

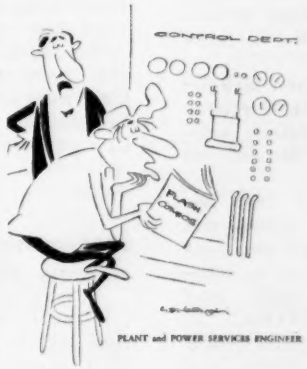
In other ways, installations are simplified — an optional location of the cross-bar is possible, and the need for bussed riser sections to transfer cross-bussing to a top or bottom location is, in most cases, eliminated.

In addition, the increased depth of 20 inches, front to back, assures greater air circulation, while the full 66-inch panel area provides maximum usable space.

The need to "weave" cables between bus bars is overcome.

(Bus Stack Design is development of Western Division, Square D Company, Dept. P&PSE, 4335 Valley Blvd., Los Angeles 32, Calif.)

Circle 9322 inside back cover.



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Circle 9324 inside back cover.

NEW LITERATURE

for effective plant and power services operation

Reviews of books and industrial bulletins describing equipment, supplies, services

Butterfly valves — all kinds are shown

At least 15 different butterfly valve arrangements are shown in eight-page fold-out bulletin.

Large-size chart aids in the selection of various classes of valves in sizes from 3 to 48 inches.

(Bulletin No. 583 is issued by W. S. Rockwell Company, Dept. P&PSE, 200 Eliot Street, Fairfield, Conn.)
Circle 9325 inside back cover.

Catalog fully describes signaling controller

Used for automatic control of many industrial processes, furnaces, ovens, molding machines, casting machines, pickling tanks, and extruders, electronic signaling controller is described in 4-page catalog.

Designed for two-position (off-on) control, instrument may be used with any sensing element that generates a DC signal. Corrective action occurs almost simultaneously with deviation of the input signal from the preset control point.

System accuracy is plus or minus ¼ of 1 percent of scale span; sensitivity is one microvolt; speed of response is ¼ second maximum; amplifier stability is plus or minus one microvolt; power gain is 135 decibels; minimum range is one millivolt; maximum range is one hundred millivolts.

Red and green lights on the front panel indicate process conditions and are visible from a distance.

(Instrument Section 51 is available from Thermo Electric Co., Inc., Dept. P&PSE, Saddle Brook, N.J.)
Circle 9326 inside back cover.

High-pressure boiler water treatment

Reprints of a paper telling how three major pulp and paper mills solved high-pressure boiler (above 1000 psi) feed problems in different ways have been made available.

The paper deals with treatment methods such as hot lime Zeolite, dimeneralization and the relatively new DeSilicizer process.

These high-pressure boilers require extremely pure feed water to prevent efficiency losses and serious corrosion.

(Pub. No. 120 is available from Cochrane Corporation, Dept. P&PSE, 17th Street below Allegheny Avenue, Philadelphia 32, Pa.)
Circle 9327 inside back cover.

Water treatment equipment

Complete line of water treatment equipment is pictured and described in four-page bulletin.

Equipment covered includes a unit that combines coagulation and flocculation, sedimentation and sludge removal in a single system.

Also illustrated and described are flash mixers and contactors, clarifiers and flocculation mechanisms, an automatic enclosed rapid sand gravity-filter system, an eductor type proportioning liquid chemical feeder and other water treatment and conditioning equipment.

(Bulletin SM-1013 is issued by Process Engineers, Inc., Division of The Eimco Corporation, Dept. P&PSE, 420 Peninsular Ave., San Mateo, California.)
Circle 9328 inside back cover.

Why fins?

Comparison of heat exchanger cost is made in 19-page catalog. Included is an explanation of where integral finned tube should be used, how fins affect the design of heat exchangers and fouling factors, and a comparison of "Trufin" and bare tube exchanger costs.

("Trufin Design and Cost" catalog is issued by Wolverine Tube, Division of Calumet & Hecla, Inc., Dept. P&PSE, 17200 Southfield Road, Allen Park, Michigan.)
Circle 9329 inside back cover.

Capacitor selection guide is handy

Tables for choosing proper ratings of switched shunt capacitors for induction motors are given in 6-page folder.

Tables cover motors of all standard types, enclosures, and nominal speeds, 220 to 4000 volts, 2 to 500 HP.

(Folder GED-3687 is available from General Electric Company, Dept. P&PSE, Schenectady 5, N.Y.)
Circle 9330 inside back cover.

Acid-resistant stainless steel

A sulfuric acid-resistant stainless steel called "Union 20-S" is described in a 4-page folder.

General corrosion and welding information is given along with forms in which the corrosion-resistant alloy is stocked.

(Folder is issued by Union Steel Corp., Dept. P&PSE, Union, N. J.)
Circle 9331 inside back cover.

Easy way to select high-pressure lube

Choice of proper lubricant for practically any extreme pressure lubrication job is facilitated with four-page selector chart.

Chart evaluates every type in molybdenum disulfide dry-film lubricant line. Evaluation is based on temperature, environment, method of application, incorporation into common materials, and recommendations for various parts, operations and conditions.

Brief technical description of each lubricant is also included.

(Bulletin 110 is issued by The Alpha-Molykote Corporation, Dept. P&PSE, 65 Harvard Ave., Stamford, Conn.)
Circle 9332 inside back cover.

Gives rheostats details

Photographs, tables and graphs give full details on series of rheostats featuring sturdy construction and precise current control.

Included is a complete discussion of a new cage type rheostat for complete operator safety.

(Bulletin 41 is issued by James G. Biddle Co., Dept. P&PSE, 1316 Arch Street, Philadelphia 7, Pa.)
Circle 9333 inside back cover.

Emergency power case histories

How portable, mobile and standby electric generating plants reduce operating costs at various utilities is described and illustrated in 10-page publication.

Services cover critical power supply for mobile test units to power supplies for drills, saws and floodlights.

("Power Points Digest", Vol. 14, No. 3, is available from D. W. Onan & Sons Inc., Dept. P&PSE, 2515 University Ave., S.E., Minneapolis 14, Minn.)
Circle 9334 inside back cover.

The care and cleaning of industrial floors

Covering 50 years of experience in cleaning industrial floors of every kind, 10-page booklet, complete with charts, lists cleaning compounds and descriptions of cleaning methods.

(Booklet F10593 is issued by Oakite Products, Inc., Dept. P&PSE, 157 Rector St., New York 6, New York.)
Circle 9335 inside back cover.

Vertical battery chargers use 2/3 less space

Compact, vertically mounted motor-generator battery chargers which use up to 2/3 less floor space are described in four-page bulletin.

Pointing up major design features with photos and line drawings, the bulletin presents a one-two-three procedure for operating the charger. Dimensions, ratings of the various models, sizes and other specification information are included in chart form.

(Form 6259 is issued by Exide Industrial Division, The Electric Storage Battery Company, Dept. P&PSE, Rising Sun and Adams Avenues, Philadelphia 20, Pa.)
Circle 9336 inside back cover.

Lots of tables explain electrical insulation

Describing in text, tables and pictures, 12-page bulletin covers the characteristics and application range of insulating materials for electrical insulation systems.

Bulletin includes technical data on available products including mica mat, varnished cloths and papers, insulating varnishes, wire enamels, irradiated polyethylene, sealing and filling compounds, insulating finishes and adhesives.

(Bulletin GET 2929 is issued by General Electric Company, Dept. P&PSE, One River Rd, Schenectady 5, New York.)
Circle 9337 inside back cover.

How to handle wire-cable reels

Humorously illustrated on posters are do's and don'ts to help safeguard the handling of reels. The posters inform customers and carriers to "lift and transport reels with flanges resting on truck forks, roll reels carefully on flanges and tighten loose nuts and hardware before re-reeling."

Here are some don'ts — "don't use truck forks vertically against cable insulation to lift or transport reels; don't push reel flanges against cable; and don't damage reels by dropping them on their flanges."

Suitable for use around plants and shipping docks, the posters come in two sizes — 8½" by 11", and 12¼" by 17", with the latter printed on cardboard stock. Small poster sells for 15c per copy; larger poster sells for 25c per copy.

(Wire-Cable Section Poster can be obtained directly from National Electrical Manufacturers Association, Dept. P&PSE, 155 East 44th Street, New York 17, N.Y.)

Describes solid front gages

Line of solid-front, pressure-indicating and test gages is described in 4-page catalog. Gages are housed in rigid case with integrally cast front shield to protect personnel in the event of a blow-out.

Over-pressure conditions are relieved by the full nylon blow-out back, a corrosion-proof, weather-proof feature.

Brochure gives complete construction details for 4½", 6", and 8½" diameter gages, both flush and surface mounted. Separate sections spell out gage specifications, materials of construction, standard graduations, types of cases and rings, gage dimensions and weights.

(Brochure 500SF is issued by Crosby Valve & Gage Co., Dept. P&PSE, Wrentham, Massachusetts.)
Circle 9338 inside back cover.

Light-wall stainless steel pipe fittings

Light-wall stainless steel fittings and flanges for non-critical process piping are described in a six-page bulletin. Line features long tangent fittings, unique rotating insert flanges and a reversible plug-and-cap.

Illustrations show different methods of joining light-wall fittings and pipe, including a sequence of photos on making "rolled in" flanged assemblies. Charts give dimensions of the new line of fittings and flanges, design properties of 5S and 10S pipe and dimensional tolerances.

("Pipe-Mate" Bulletin is issued by Tube Turns, Division of Chemetron Corp., Dept. P&PSE, 222 East Broadway St., Louisville 1, Kentucky.)
Circle 9339 inside back cover.

All about water softening

Water treating equipment is presented in 24-page booklet. The newest in manual and automatic zeolite water softeners, demineralizers and deionizers, dealkalizers, ion exchangers, filter purifiers, aerators and degasifier are described.

Also covered are spray and tray type deaerating heaters and water treating chemicals for every need.

(Bulletin 615 is issued by Elgin Softener Corp., Dept. P&PSE, 136 N. Grove St., Elgin, Ill.)
Circle 9340 inside back cover.

Hand tachometers

Four-page bulletin contains detailed technical data on five models of hand tachometers.

Each model is fully pictured, and complete range of sizes is included for each.

(Catalog 61 is issued by Jones Motrola Corp., Dept. P&PSE, 432 Fairfield Ave., Stamford, Conn.)
Circle 9341 inside back cover.

Chart aids selection of coatings

Designed to aid engineers and maintenance personnel in the selection of corrosion-resistant protective coatings, four-page chart compares 17 standard systems showing the strong and weak points of each.

Accurate resistance ratings are listed for acid, alkali, solvent, water, weathering, flexibility, impact and abrasion, and temperature conditions.

(Chart No. 5 is available from Carboline Company, Dept. P&PSE, 32 Hanley Industrial Court, Brentwood 17, Missouri.)
Circle 9342 inside back cover.

For more information on items reported in the New Literature section circle corresponding numbers on reader service card opposite back cover.

Standardized gear, fluid drives

Forty-eight page book describes complete line of gearmotors, motogears, and fluid drives.

Function of these various types of drives as well as detailed data, dimensions, overhung load ratings and mountings are fully covered. It also lists such accessories as couplings, backstops and slide rails.

For a given gear frame size, the housing, low-speed shaft, low-speed bearings and low-speed gears are a constant regardless of whether they are double, triple or quadruple drive gearmotor, motogear or electrofluid drives of any output speed.

Variations in ratio are achieved by using various primary reduction gear sets.

(Book 2747 issued by Link-Belt Company, Dept. P&PSE, Prudential Plaza, Chicago 1, Illinois.)
Circle 9343 inside back cover.

Heavy protective coating

Booklet explains type of heavy protective coating, lists representative industries that have used it and discusses its protective qualities.

Case histories of actual applications, as well as laboratory tests are cited as proof of the claims made for the material's ability to protect exposed metal surfaces.

(Booklet No. B-86 is published by the Arco Co., Dept. P&PSE, 7301 Bessemer, Ave., Cleveland 27, Ohio.)
Circle 9344 inside back cover.

Tells the Eddystone piping story

The story from material selection to erection of the 316 stainless-steel power piping at Philadelphia Electric's Eddystone plant for the most severe temperature-pressure conditions (1200°F and 5000 psi) is interestingly told in 12-page brochure.

("The Eddystone Story" is available from The Fabricated Products Division, The M. W. Kellogg Company, Dept. P&PSE, 711 Third Avenue, New York 17, N.Y.)
Circle 9345 inside back cover.

High capacity spray nozzles

Spray nozzles for spraying liquids in medium to large quantities are covered in 2-page bulletin.

The nozzles produce coarse, uniformly distributed, hollow-cone sprays. Four styles provide normal spray angles of 60°, 45°, 30°, and 20°. Available in several sizes the nozzles provide a wide range of capacities depending upon the size of orifice opening and liquid supply pressure. At 10 psig, for example, nozzles provide capacities from 32 gpm up to 900 gpm. With a supply pressure of 100 psig, these nozzles deliver from 100 to 2800 gpm.

Information on capacities, sizes, dimensions, and materials of construction is included, plus a photo showing the liquid spray distribution of an operating nozzle.

(Bulletin 6A-622-1 is available from Dept. JA-20, Schutte and Koerting Co., Dept. P&PSE, Cornwells Heights, Bucks County, Pa.)
Circle 9346 inside back cover.

Lists refractory that can be shot from gun

Discussing typical applications of a chrome-base refractory material, engineered for placement by pneumatic gun, two-page bulletin describes the conditions under which it can be used to best advantage.

Properties are listed, and a picture-captioned story gives suggested installation procedures.

(Bulletin R-48 is available from The Refractories Division of The Babcock & Wilcox Company, Dept. P&PSE, 161 East 42nd St., New York 17, New York.)
Circle 9347 inside back cover.

Describes remote control for circuit breakers

Compact, rugged and economical motor-operator which can open, close or reset molded-case circuit breakers is described in four-page bulletin.

The motor-driven, electrically operated mechanism can be added to any molded-case breaker rating from 70 to 800 amps, incorporated in switchboards, control centers, individual enclosures or other types of installations.

Included in the bulletin are drawings showing principal operator dimensions and a wiring diagram which furnishes details of electrical connections and various available control options.

(Bulletin 5047-1A is issued by I-T-E Circuit Breaker Company, Dept. P&PSE, 1900 Hamilton St., Philadelphia 30, Pennsylvania.)
Circle 9348 inside back cover.

Highlights silicones

Silicone products and their uses are highlighted in 8-page catalog.

Among the important silicone uses described are: rubber products, including the new RTV (room temperature vulcanizing) silicone rubber; electrical insulation, water repellents, lubricants, and release and anti-foam agents.

Illustrated publication lists additional specialized literature covering product application information as well as major silicone products.

(Catalog CDS 129A is available from Silicone Products Dept. General Electric Co., Dept. P&PSE, Waterford, New York.)
Circle 9349 inside back cover.

Offers technical paper on gas temp measuring

A technical paper on gas temperature measurement from 2500° to 3500°F has been made available.

The paper discusses some of the work done to develop suitable primary elements for these high-temperature applications — specifically the measuring of point temperatures.

Advantages and disadvantages of both thermocouples and pneumatic probes are pointed out.

(Technical paper on Gas Temperature Measurement is available from Thermo Electric Co., Inc., Dept. P&PSE, Saddle Brook, N.J.)
Circle 9350 inside back cover.

All about cams

Numerous charts and graphs to aid in the selection of standard, semi-standard and special plate cams are contained in eight-page catalog.

Various designs and shapes are illustrated.

(Catalog No. 900 is available from Ferguson Machine Corp. of Indiana, Dept. P&PSE, 7818 Maplewood Industrial Court, St. Louis 17, Missouri.)
Circle 9351 inside back cover.

Shows 2 oil-immersed motor controllers

Two classes of oil-immersed, explosion-proof, corrosion-resistant, weather-proof, 2000-5000v motor-starters are described and illustrated in four-page bulletin.

Complete information giving construction, test results, and specifications for a floor-mounted lift-out type and a frame-mounted tank lowering type is included.

(Bulletin 14B8750 is issued by Allis-Chalmers Manufacturing Company, Dept. P&PSE, Milwaukee 1, Wis.)
Circle 9352 inside back cover.

Catalogs manifolds for gases

Newly revised catalog describes complete line of manifolds for industrial gases.

The catalog's twenty-four pages contain specific information — with illustrations — on capacities, dimensions and arrangement, along with general background material on the advantages of manifolding.

(Form ADC 636E is issued by Air Reduction Sales Company, a division of Air Reduction Company, Inc., Dept. P&PSE, 150 East 42nd St., New York 17, N.Y.)
Circle 9353 inside back cover.

Electroluminescence theory, use given

Phenomenon of electroluminescence and its application in lamps are subject of four-page booklet.

Details such as construction of readout lamps, capabilities and advantages of various lamp types are included together with principal mechanical, electrical and visual characteristics.

("Rayescent Readout Lamps" is issued by Westinghouse Electric Corporation, Lamp Division, Dept. P&PSE, MacArthur Ave., Bloomfield 7, New Jersey.)
Circle 9354 inside back cover.

NEW!

Crane Formula 425-A Thread Compound prevents seizing and galling

It's the best lubricating compound you can get for high loading, high temperature installations up to 1050° F.—screwed or flanged. Prevents seizing and galling damage to pipe threads, bolts and gaskets . . . gives tight metal-to-metal contact. Joints open readily—and you can re-use materials—even after long exposure to high heat. Conforms to Military Spec. MIL-A-907. Stocked in 1- and 4-pound cans by your local Crane Branch or Crane Wholesaler.

FREE SAMPLE . . . Just ask your Crane Representative

CRANE® Crane Co., Gen'l Off.: 836 S. Michigan Ave., Chicago 5, Ill.

Circle 9355 inside back cover.

YOU CAN EARN 20 DOLLARS

BY HAVING A NOMOGRAPH IN

Plant and Power Services Engineer

PLANT and POWER SERVICES ENGINEER is looking for good nomographs designed to simplify calculations necessary to efficient plant and power services. If you have such a nomograph that has been helpful to you in your work — and it has not been published before — send it to:

Data Editor
PLANT and POWER SERVICES ENGINEER
111 E. Delaware Place
Chicago 11, Illinois

CUT HERE AND FILE

Pressure drop nomographs

JAMES E. GARDNER
The Atlantic Refining Company
Philadelphia, Pa.

These nomographs are used to calculate frictional pressure losses for turbulent fluids flowing through commercial steel pipe.

Procedure consists of two short steps: First, velocity head of fluid is calculated from Figure 1; then, number of velocity heads lost in pipe system is calculated by means of Figure 2 (page 43). Product of these two values is total frictional pressure drop through the system.

Figure 1 is based on the following:

$$VH_{ft} \propto \frac{V^2}{D^4}$$

$$VH_{psi} \propto VH_{ft} \times sg$$

$$VH_{ft} = \frac{v^2}{2g} \quad \text{by definition}$$

Figure 2 is based on the Moody[1] friction factor plot for clean commercial pipe, the relationship being:

$$L_{VH} = \frac{D}{f} \quad (D \text{ and } L_{VH} \text{ in same units})$$

Division of total equivalent length of pipe by the value of L_{VH} yields number of velocity heads lost, because of friction, by a fluid flowing through the pipe system. Reynolds number is

$$N_{Re} = 7730 \frac{dv}{\eta}$$

which is convenient since Figure 1 gives linear velocity v. Extrapolation of Figure 2 is not recommended.

To page 43

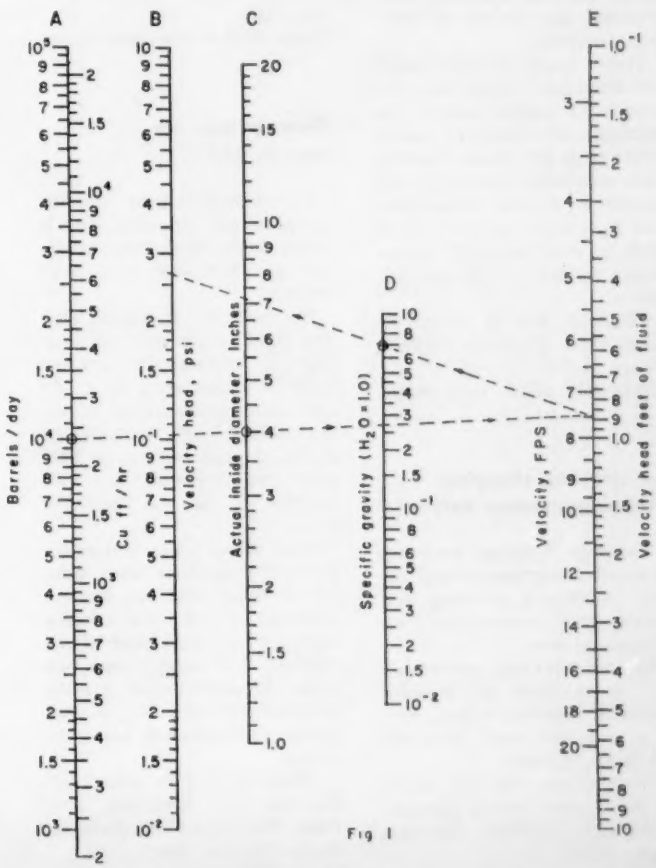


Fig 1

Using dry chemical fire extinguisher

Four-page booklet outlines "how to use" and "recharge" techniques for 2½, 5, 10, 20 and 30 pound models of any dry chemical fire extinguishers.

Back cover is devoted to a chart which explains the three classes of fires and the approved portable extinguishers to be used on each.

Fire detection equipment and cylinders are also covered.

(Brochure No. P-48 is published by Walter Kidde & Company, Inc., Dept. P&PSE, 675 Main St., Belleville, New Jersey.)
Circle 9356 inside back cover.

Automatic control package for engine compressors

Packaged automatic control panels for engine-driven compressors is subject of ten-page bulletin.

Three basic control panels are described. These include: sequenced engine control for starting or stopping engine with push of single button; fully automatic control for all phases of engine, compressor and yard valve operation from start to stop; and fully automatic control for remote location.

(Bulletin 170 is issued by Clark Bros. Co., Dept. P&PSE, Olean, N.Y.)
Circle 9357 inside back cover.

For starting, stopping engine-generator sets

Six-page bulletin describes in detail a starting control for fully automatic starting and stopping of engine-driven generating sets.

In addition, associated equipment such as transfer switches, solenoid valves, battery chargers and solenoids has been included.

(Publication 653 is issued by Automatic Switch Company, Dept. P&PSE, Florham Park, N.J.)
Circle 9358 inside back cover.

Oxygen therapy in industry

Equipment and techniques for use during industry's "most urgent emergency" — the interruption of a worker's breathing — is discussed in 12-page booklet.

Included is a description of a unit worn on the back which leaves the rescuer's hands free to aid the victim; an intermittent positive pressure breathing unit for prevention and treatment of industrial respiratory disorders; and oxygen piping systems for plant hospitals and first-aid areas.

Many conditions, the booklet points out, can cause stoppage of breathing: illness, electrical shock, asphyxiating gases, suffocation from smoke, and chemical irritants.

(Bulletin NM-116 is available from National Cylinder Gas Division of Chemetron Corporation, Dept. P&PSE, 840 N. Michigan Ave., Chicago, Ill.)
Circle 9359 inside back cover.

Gear pumps — how to use

Herringbone gear pumps designed for pumping liquids which have lubricating qualities are described in 4-page bulletin.

Stocked in standard iron and steel construction in sizes from ½" through 4", they are built in larger sizes up to 8" and in other materials to order. Designs are available to pump at pressures up to 1000 psig, and to handle low viscosities of up to 10,000,000 SSU.

Gear pump types and models including those with babbit or roller bearings, steam-jacketed types, and base-mounted complete with drive motors. Cut-away drawings illustrate construction details. Dimensional data and driving power requirements are presented.

(Bulletin G-1 is issued by Schutte and Koerting Co., Dept. P-G, Cornwells Heights, Bucks County, Pa.)
Circle 9360 inside back cover.

Small vertical gages for any use

Compact group of individual miniature vertical gage units are illustrated in four-page specification.

Details of pointer movement, 3¼-inch scale design, and optional internal illumination are provided.

(Product Specification P11-1 is available from Bailey Meter Company, Dept. P&PSE, 1050 Ivanhoe Road, Cleveland 10, Ohio.)
Circle 9361 inside back cover.

Air-cooled compressors

Specifications on eight sizes of air-cooled compressors in the 15 to 125 hp; 81 to 641 cfm range are given in 16-page bulletin.

Cross section drawings and a complete run-down on all vital components are also included.

(Bulletin A-56 is issued by Joy Manufacturing Company, Dept. P&PSE, Oliver Bldg., Pittsburgh 22, Pa.)
Circle 9362 inside back cover.

Industrial waste, water conservation in film

Practical solutions to the problems of industrial waste and water conservation are shown in 16-mm sound and color motion picture, "Pure and Simple."

The film shows how water problems are solved by installation of sewage and industrial waste treatment at various types of plants.

("Pure and Simple" is available without cost on letterhead request from Public Relations Department, Link-Belt Company, Dept. P&PSE, Prudential Plaza, Chicago 1, Illinois.)

Steam specialties

Steam specialties are described in 12-page composite product bulletin. Valves, thermostatic traps, float and thermostatic traps, steam traps (250 psig maximum pressure as well as blast and high pressure) and pipe line strainers.

Dimensions, capacities, patterns, weights and accessories are highlighted. Outstanding features of the valves, floats and traps, their construction and operation are fully explained.

(Bulletin 203 is available from Dept. PD, American Air Filter Co., Inc., Dept. P&PSE, 215 Central Ave., Louisville 8, Kentucky.)
Circle 9363 inside back cover.

Industrial transformers

Describing substation transformers rated single-phase, 500 kva and below, 15 kv and below, for use in distribution and industrial substations, eight-page bulletin fully illustrates exterior and interior features.

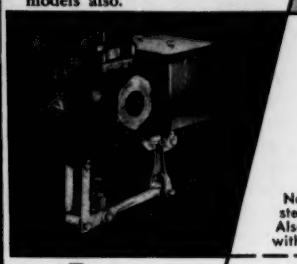
A weight and dimensions table is included in the discussion.

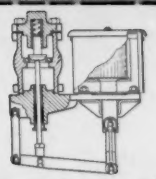
(Bulletin GEA-5452A is available from General Electric Company, Dept. P&PSE, Schenectady 5, N.Y.)
Circle 9364 inside back cover.

BIG LINE-UP
BIG PERFORMANCE

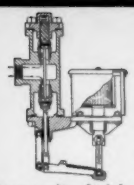
Johnson Solenoid Valves are built for heavy duty service . . . handling, air, water, steam, heavy viscous liquids. No pilots or pistons; powerful leverage design opens smaller valves against 250 lbs. Because of the remoteness of the solenoid, temperatures up to 400° F. are easily handled without adverse effect on the solenoid coil. Bodies are bolted together. Explosion-proof models also.

JOHNSON
Direct Operated
SOLENOID VALVES

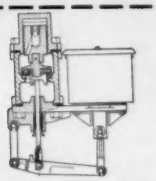




Normally closed service, stainless steel valve and seat. Sizes ⅜"-3". Also for normally open service, and with Jenkins Disc.



3-way valve. Stainless steel valves and seats. Sizes ½"-1½".

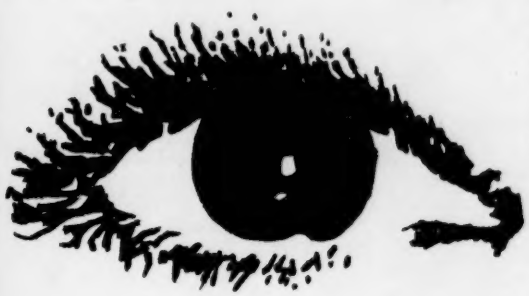


Dashpot construction, cushions closing to avoid water hammer. Jenkins Disc. Sizes ¾"-2".

Write for Bulletin "V"

THE JOHNSON CORPORATION
807 Wood St., Three Rivers, Mich.

Circle 9365 inside back cover.



LOOKING FOR A FUEL DETECTOR?

Read about the latest development in fuel detectors. This story is in the NEW DEVELOPMENT section which starts on page 28. You'll find descriptions of many other types of plant and power services equipment there, too.

CUT HERE AND FILE

Pressure drop nomographs

Other uses of Figure 1 are in choosing the proper diameter of pipe to give a certain linear velocity and in calculating velocity heads for expansion and contraction losses.

Typical Example

Find the velocity, velocity head in feet of fluid, and the velocity head in psi for 10,000 barrels per day (or 2333 cu ft/hr) of fluid with a specific gravity of 0.7 flowing through a 4-inch ID pipe.

Reading the scales of Figure 1 in the order of A-C-E, the velocity is 7.5 ft/sec and VH_{ft} is 0.88 ft. Reading the scales in the order of E-D-B, VH_{psi} is 0.27 psi.

What would be the total frictional pressure drop if this fluid had a viscosity of 10 centipoises (14.3 centistokes) and pipe system had a total equivalent length of 2000 ft?

$$N_{Re} = 7730 \frac{dv}{\eta} = \frac{7730(4)7.5}{14.3} = 16{,}200$$

At $N_{Re} = 16{,}200$ (scale A, Figure 2) and an inside diameter of 4 inches (scale B), the length of pipe per velocity head of pressure is 11.6 ft (scale C). Total pressure drop is

$$0.27_{psi}\left(\frac{2000\ ft}{11.6\ ft}\right) = 46.5_{psi}$$

NOMENCLATURE

d	=	inside diameter of pipe, inches
D	=	inside diameter of pipe, in general
f	=	Moody friction factor
g	=	gravitational constant, 32 ft/sec²
η	=	kinematic viscosity, centistokes
L_{VH}	=	length of pipe through which fluid pressure drop is equal to one velocity head
N_{Re}	=	Reynolds number
sg	=	specific gravity
v	=	velocity, ft/sec
V	=	volumetric flow rate, in general
VH_{ft}	=	velocity head, ft of fluid
VH_{psi}	=	velocity head, pounds per square inch

LITERATURE CITED

1) Moody, Lewis, Trans ASME, 66, 671 (1944)

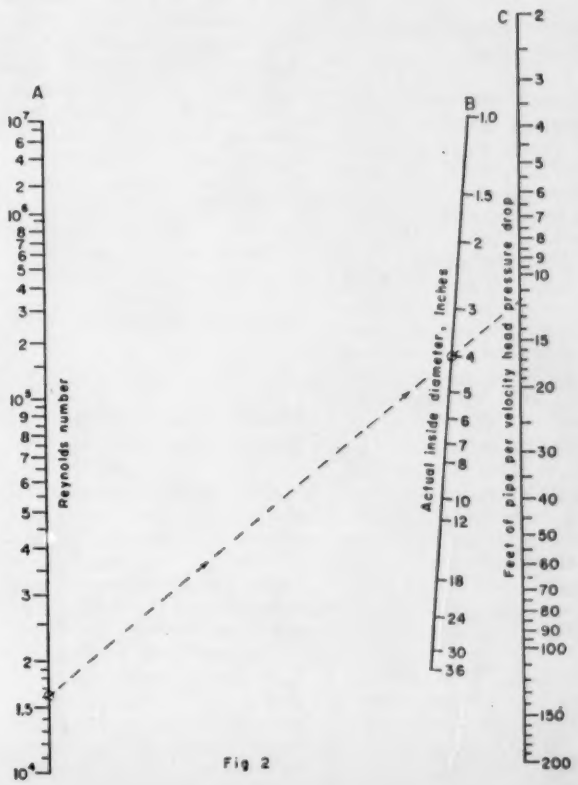


Fig 2

Saturable reactors for better power control

Saturable reactors to regulate and control electric power for manufacturing processes are covered in 4-page bulletin.

Any amount of AC power from 1 kva to 3000 kva, single- or three-phase, at any voltage, can be controlled and regulated in stepless increments. Control can be by manually operated hand wheel, or automatically by thermostat or other instrument or device.

Units can be used to control and regulate temperature of electric furnaces, ovens, metal or glass melting, dimming incandescent and infrared lamps, and various chemical processes.

(Bulletin 658 is issued by Sorgel Electric Co., Dept. P&PSE, 838 West National Ave., Milwaukee 4, Wis.)
Circle 9366 inside back cover.

Sanitary engineering equipment book

Profusely illustrated with photographs, 20-page book shows latest sanitary engineering equipment and flow diagrams of how equipment can be installed in typical water, sewage and industrial waste treatment plants.

Six types of screens, three types of straightline mixers, straightline grit collectors and grit washers, and straightline and circular sludge collectors are standard equipment described.

Additional equipment for specific requirements includes motor-driven scum skimmers, roto-line scum pipes, traveling bridge sludge collectors and a motor driven transversing bridge, with a belt conveyor, for the removal of sludge from sludge drying beds.

(Book 2617, "Water, Sewage and Industrial Waste Treatment Equipment," is issued by Dept. PR, Link-Belt Company, Dept. P&PSE, Prudential Plaza, Chicago 1, Ill.)
Circle 9367 inside back cover.

Covers check valves for many uses

Check valves are described in two-color, two-page circular. Abundantly illustrated the circular describes many types of check valves: bronze, iron, and steel for boiler feed lines for air, water and steam lines; and for controlling chemical and gaseous fluids.

(Circular No. 588 is issued by Lunkenheimer Co., Dept. P&PSE, Beekman St. at Waverly Ave., Cincinnati 14, O.)
Circle 9368 inside back cover.

Chemical cures, seals concrete surfaces

Four-page brochure fully describes application and test data on a chemical compound for curing, sealing and dustproofing newly-poured concrete surfaces in one operation.

A blend of synthetic rubber resins in fast evaporating solvents, the chemical produces a transparent, hard glossy film to protect the floor from traffic abrasion, water spillage, mild acids and alkalies.

It is applied to freshly laid concrete to promote water retention and complete hydration of the cement.

(Bulletin BP 1071 is issued by the Building Products Division, L. Sonneborn Sons, Inc., Dept. K, 404 Fourth Ave., New York 16, N.Y.)
Circle 9369 inside back cover.

Precision limit switch details given

Full descriptive details and engineering data are presented in four-page bulletin covering a precision limit switch which has proved itself by surpassing 55,000,000 cycles under electrical load.

Focal point of the bulletin is a large, actual size, exploded view of the switch with descriptive caption of the various parts of the switch that identify the oil-impregnated bearings and nylon surfaces resulting in an extremely low coefficient of friction, large contact gaps and other long-life features.

(Bulletin M-1 is issued by R. B. Denison Mfg. Co., Dept. P&PSE, 102 St. Clair Ave., N.W., Cleveland 13, Ohio.)
Circle 9370 inside back cover.

Electronic air cleaner principles given

Giving details of operation and electronic principle, 16-page bulletin describes electronic air cleaner and includes an explanation of the agglomerator and storage sections, equipment drawings, capacity and dimension tables, specifications and a list of typical installations.

The unit is designed specifically for use with unit-type air handling equipment in heating, cooling and ventilating.

(Bulletin 249A is available from Dept. PD, American Air Filter Co., Inc., Dept. P&PSE, 215 Central Ave., Louisville 8, Kentucky.)
Circle 9371 inside back cover.

"Hey Pete . . C. J. here wants some paint for his patio, strictly on the Q.T."

How to control condensate

Drawing upon case histories, brochure describes closed loop system for condensate control.

The names of 156 nationally known concerns in twenty-one different industries are given. Brochure tells how these companies use the system for increased productions, lower steam cost, improved product quality and improved plant efficiency.

(Publication 6001-B is issued by Cochrane Corporation, Dept. P&PSE, 17th Street below Allegheny Ave., Philadelphia 32, Pa.)
Circle 9372 inside back cover.

Vibration recorder

Hand vibration recorder is described in 2-page folder.

Small, non-electric, hand-held instrument makes a tape recording of machine vibration amplitude. It enables taking of periodic readings of vibration amplitude to provide information which can be translated into terms of bearing or cutting tool wear.

Device is useful in spotting machine wear and overload before costly maintenance problems develop.

(Bulletin K12A is issued by the Korfund Company, Inc., Dept. P&PSE, 48-15 32nd Place, Long Island City 1, New York.)
Circle 9373 inside back cover.

Air compressors for industry

Heavy duty industrial air compressors are described in new 12-page bulletin. Included are specifications and dimensions in six basic models ranging from 350 to 1250 hp and 2418 to 7392 cfm.

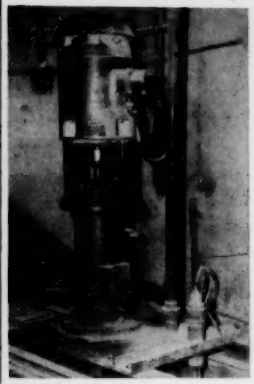
Clearly illustrated in a two-page cross section drawing are semi-radial design features.

(Bulletin A-73 is issued by Joy Manufatcuring Co., Dept. P&PSE, Oliver Bldg., Pittsburgh 2, Pa.)
Circle 9374 inside back cover.

This NAGLE PUMP

resists the "Grinding Wheel" abrasion of ash laden water

Disposal of ash from boilers by pumping is as practical as electric light. BUT a slurry of ash and water is highly abrasive—tough on pumps. This Nagle 1½" Type "CWO-C" Pump has given excellent, care-free service for over 2 years—handling ash to waste at the Passaic, N.J. plant of a well-known mechanical rubber goods producer.



There are no submerged bearings, no rubbing contact between revolving and stationary parts below the radial bearings, no stuffing box to give trouble, nothing to bind or clog. Many plants operating boilers use Nagle Pumps for ash disposal. Send for Nagle Pump Selector. Representatives in principal cities. Nagle Pumps, Inc., 1228 Center Ave., Chicago Heights, Ill.

Tough jobs call for

NAGLE PUMPS

NAGLE-PUMPS, INC.
1228 CENTER AVE., CHICAGO HEIGHTS, ILL.

PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

Circle 9375 inside back cover.

IS YOUR COMPRESSOR LITERATURE FILE INCOMPLETE

A new bulletin on compressors is being offered. You'll find a review of this bulletin in the NEW LITERATURE section, starting on page 38. This bulletin is just one of some 95 selected pieces of plant and power services literature reviewed in this issue.

CUT HERE AND FILE

Pressure conversion charts – I

Nomograph by Putman Staff

Conversion of pressure into various units is a relatively simple operation.

However, conversion of a large amount of data is sometimes tedious and prone to error. These nomographs convert pressures from one set of common units to any or all of others.

On this page, the units are: inches of mercury, inches of water, ounces per square inch, and pounds per square inch.

Next month, we will present a chart for the following units: mm Hg, ft water, inches Hg, psig and psia.

To use the nomograph, simply place a straight edge so that it intersects the known value and lies across the center of the bull's-eye. Readings on all scales will then be equivalent.

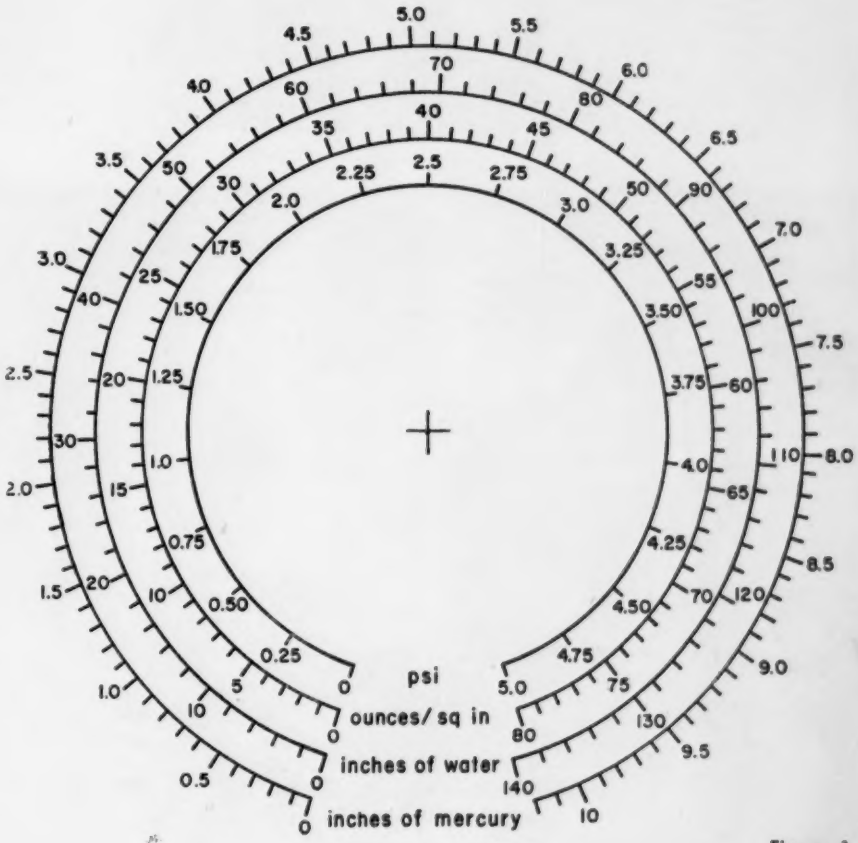
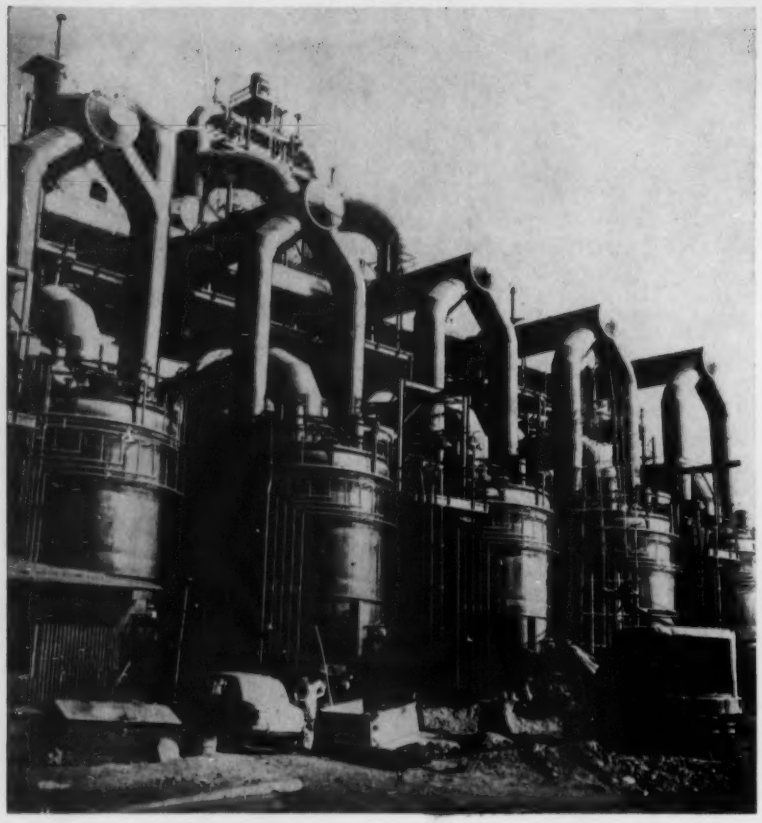
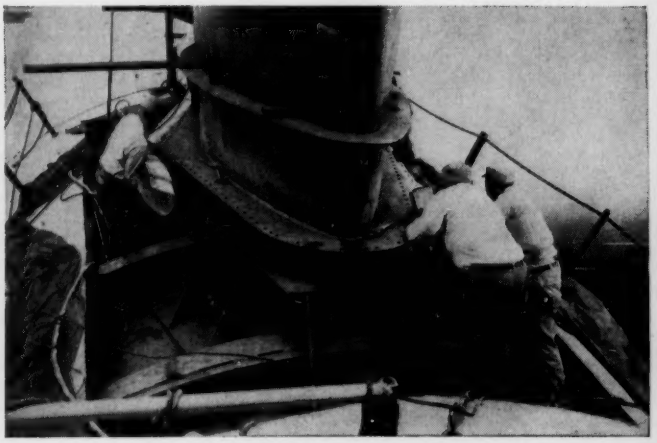


Figure 1

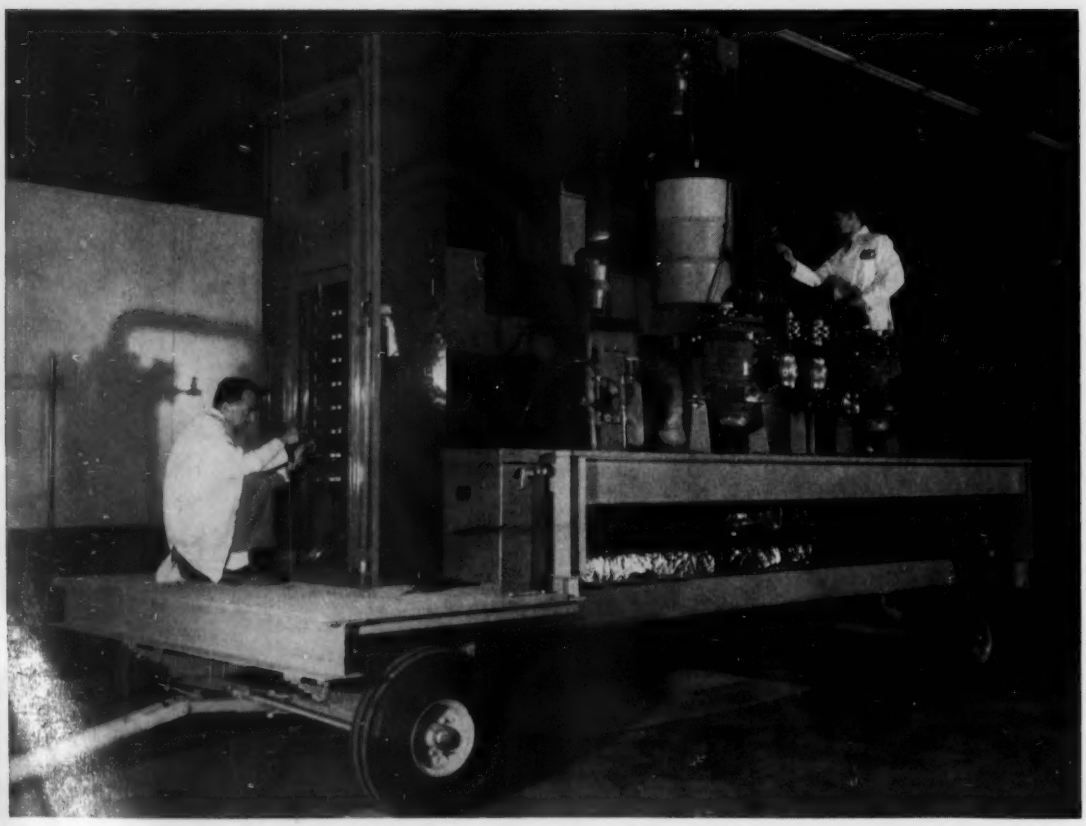
PHOTO NEWS



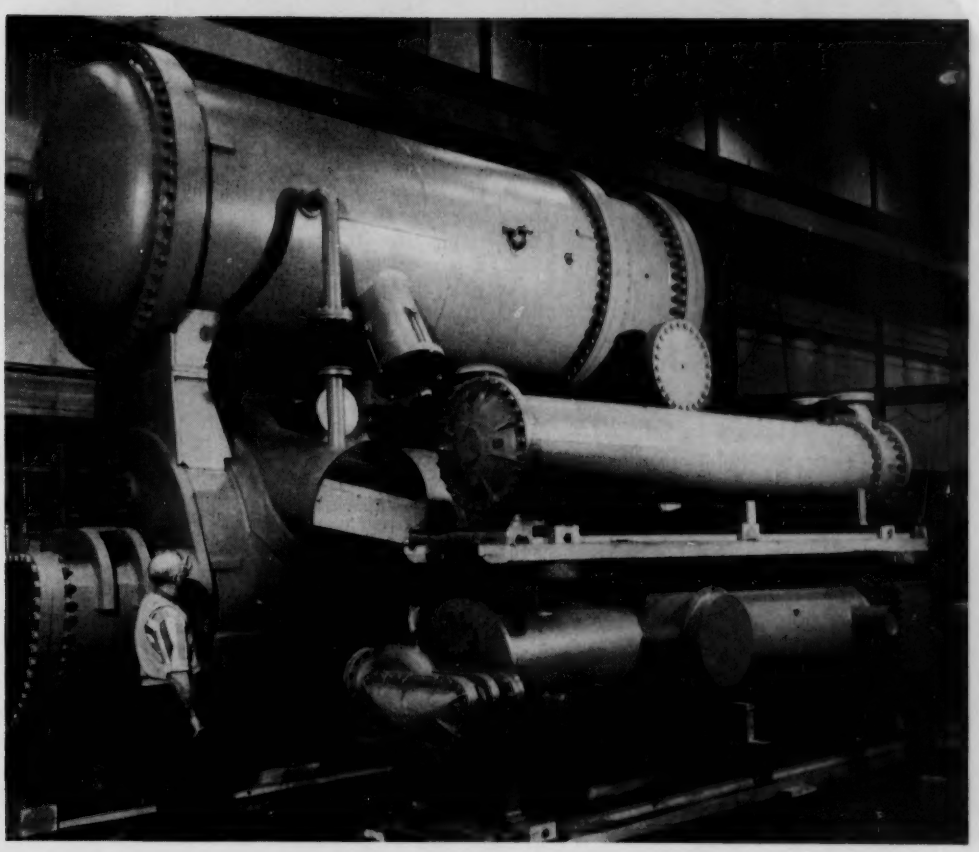
A LOT OF HOT AIR — The world's largest electrostatic precipitator installation for cleaning of blast furnace gases has been completed at the Tata Iron & Steel Co., India. The Research-Cottrell units are designed to clean 360,000 cfm total gas (at standard conditions) at 105°F with 96.7 percent rated efficiency, after the gas from two blast furnaces has passed through dust catchers and wash towers.



A SUBMARINE CONNING TOWER? No, it's an extremely large elliptical-shaped rubber expansion joint being positioned on the air scoop connection of a large wind tunnel. The joint, manufactured by Garlock Packing Company, is used to dampen vibrations during tests of aircraft and spacecraft propulsion systems under high velocity conditions.

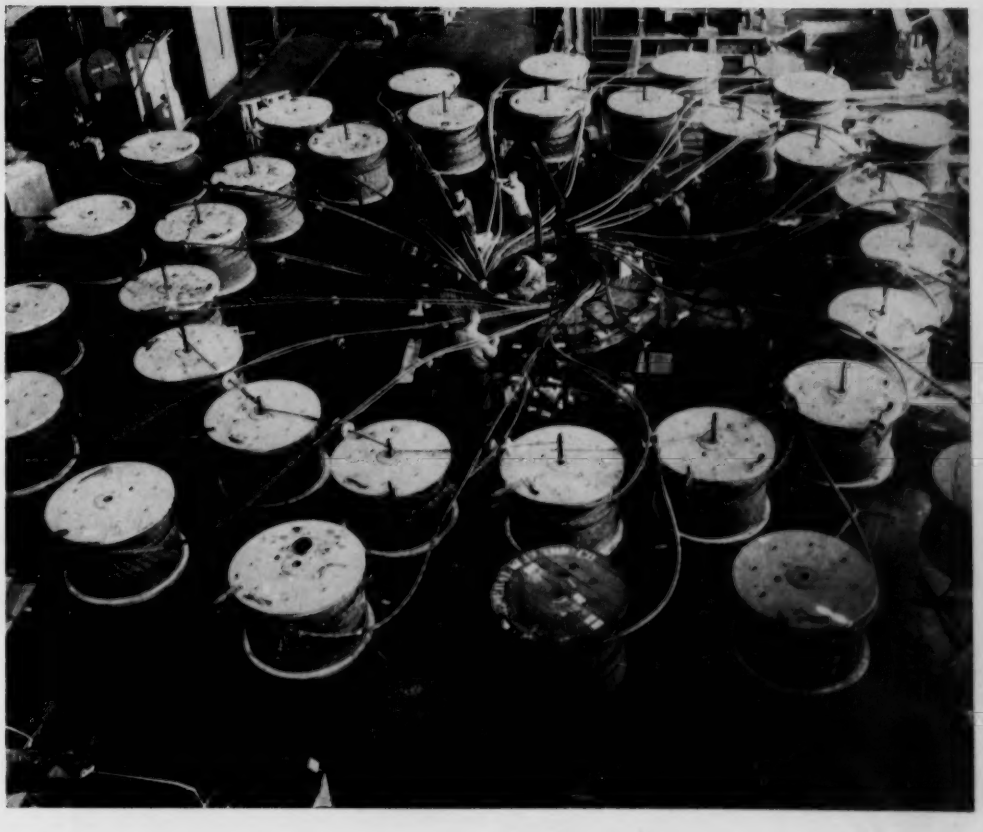


MOBILE SODIUM MELTING UNIT has eliminated need for stationary melting stations at field test facilities of Atomics International. The sodium is used as a coolant in sodium-graphite nuclear power reactors.



CHILLER'S BIG BROTHER — Water chilling vessels for a single office building drawf average-size set (foreground) on shipping dock at Carrier Corp. Giant assembly is one of two identical units that will produce chilled water in air conditioning system of the 60-story Chase Manhattan Building in New York City. The system will supply 9140 tons of refrigeration.

AFTER THE BLOW, this was what was left of a warehouse belonging to Sandusky Foundry & Machine Co., Ohio. Although the building was all but collapsed by a severe spring windstorm, 99 percent of the translucent sheets of fiberglass panels were salvaged from a wall that crumbled. On remaining walls, the panels stayed in place.



"COME INTO MY PARLOR. . ." These workmen may look as if they are in a spider's "parlor," but actually they are winding a huge induction coil in a GE plant. Finished coil will contain six miles of cable, weigh 60 tons, and stand five feet high.

Features duct fan line

Line of belt-drive duct fans with adjustable driver sheaves which permit quick easy adjustment of fan speed is featured in 12-page bulletin.

In addition to the belt-drive duct fans, in sizes from 12″ to 60″, bulletin also gives dimensions, performance data and construction details on direct-drive duct fans in the same size range.

Bi-pass duct fan which has the motor mounted in a tunnel completely out of the airstream is described, as well as reversible duct fan which moves air in either direction with equal efficiency.

(Bulletin A-114A is published by Hartzell Propeller Fan Co., Dept. P&PSE, 1964 Shroyer Ave., Piqua, Ohio.)
Circle 9376 inside back cover.

Describes gate valves for ductile iron pipe

Covering a line of gate valves designed specifically for ductile iron lines, eight-page bulletin lists complete specifications, pressure-temperature ratings, and dimension and material charts.

The valve is described as "the spread flange design" which features a high visibility bonnet joint and extra long bolts for storage of bolting energy.

(Form 1010 is issued by The Ohio Injector Company, Dept. P&PSE, Wadsworth, Ohio.)
Circle 9377 inside back cover.

Perforated metal screens described

How to specify perforated metal for coal and aggregate screens is described in 12 steps.

Perforated steel sheets and plates are rigid one-piece units with uniformly spaced hexagons, square or round perforations, die-perforated with precision-made, multiple-punch tools for accurate, clean-walled perforations.

In addition, the brochure describes "Hexcreen," pierced sheets, and wedge-shaped wire screens.

(Metal Screen Brochure is issued by Cross Perforated Metals Plant, Dept. P&PSE, National-Standard Company, Carbondale, Pa.)
Circle 9378 inside back cover.

Adjustable-speed drive booklet

Eight-page bulletin discusses adjustable-speed and drive control problems. Typical applications along with methods and types of remote and automatic control, plus variable speed bedplate assemblies are included.

(Bulletin No. K-250 is issued by the Cleveland Worm & Gear Company, Speed Variator Division, Dept. P&PSE, 3300 East 80th St., Cleveland 4, Ohio.)
Circle 9379 inside back cover.

Displays piston cups — hydraulic, pneumatic

Containing tables illustrating the most popular molded cups for recommended services on pump pistons, hydraulic service and for pneumatic equipment, six-page fold-out bulletin updates previous literature.

Detailed information is given on construction, and available sizes of rubber and synthetic rubber, leather, reinforced synthetic rubber, metal bonded and metal reinforced and homogeneous cups.

A section is devoted to the conversion of pistons designed for operation with hydraulic ring packings to pistons designed for use with pump cups — this includes pistons for tapered and straight rods.

(Bulletin AD-145 is available from The Garlock Packing Company, Dept. P&PSE, 436 Main Street, Palmyra, New York.)
Circle 9380 inside back cover.

"A corrosion engineer is an expert in . . . did you say SCALE REMOVAL?"

Catalogs dry bushings, thrust washers

Information on dry bushings and thrust washers and alternate installation tolerances and instructions for fitting bushings is described in 4-page bulletin.

A complete list of available thrust washers along with part numbers and dimensions of each and instructions for fitting washers is included.

(Bulletin DU-458A is available from United States Gasket Co., Dept. P&PSE, Camden 1, N.J.)
Circle 9381 inside back cover.

Simplifies feedwater heater bypass

Four-page bulletin describes line of three-way valves for regulating boiler feedwater flow. These valves are designed for two-position operation, to effectively and economically direct flow to, or bypass around, the feedwater heater.

They are available with handwheel operator acting directly or through spur gears, or with motor-operator for remote or automatic operation. Valves are serving in systems at 3500 psig and 500°F.

(Bulletin 8F is issued by Dept. V-E, Schutte and Koerting Company, Dept. P&PSE, Cornwells Heights, Bucks County, Pa.)
Circle 9382 inside back cover.

Fully illustrates meter-relays

How meter-relays measure and control practically any variable that can be detected electrically is graphically described in 4-page bulletin.

Other products are also shown, including panel meters, non-indicating meter-relays, and complete controls incorporating meter-relays.

(Bulletin S-1 is available from Assembly Products, Inc., Dept. P&PSE, Chesterland, Ohio.)
Circle 9383 inside back cover.

Reviews transmission machinery

A brief but comprehensive review of line of power transmission machinery is present in eight-page bulletin.

Featuring dry fluid drives and rubber-tire couplings, the bulletin also gives illustrated descriptions of steel conveyor pulleys, roller chain drives, various types of shaft coupliings, and compact V-belt drives.

Other products included are pillow blocks with tapered roller bearings, spherical roller bearings, ball bearings and sleeve bearings, take-ups, friction clutches and speed reducers.

(Bulletin A-706 is issued by Dodge Manufacturing Corporation, Dept. P&PSE, Mishawaka, Ind.)
Circle 9384 inside back cover.

Selects right cement for refractory job

As an aid to cutting industrial furnace costs by properly matching refractory mortars and brick, 16-page booklet, entitled "Cements, Mortars, Coatings — Coordinated to the Furnaces of Industry," contains description and data on line of such products.

Each product is listed and discussed in separate sections. Many "how-to-use" captioned photos are included.

(Refractory cement booklet is available from Mexico Refractories Company, Division of Kaiser Aluminum & Chemical Corp., Dept. P&PSE, Mexico, Missouri.)
Circle 9385 inside back cover.

Pictures gas-fired intake units

Series of gas-fired intake units for supplying tempered make-up air to replace air removed by industrial exhaust systems is described in two-page bulletin.

The bulletin cites fuel costs figures to prove fuel economy of the units which achieve almost 100 percent combustion efficiency by burning natural or propane gas in a line-of-flame burner directly in the air stream.

(Bulletin A-115 is available from Hartzell Propeller Fan Company, Dept. P&PSE, Piqua, Ohio.)
Circle 9386 inside back cover.

Two ways to weld aluminum

Comprehensive survey of the techniques of welding aluminum using gas-shielded, metal-arc and tungsten-inert-gas processes is contained in 120-page spiral bound book.

Major topics include: weldability of aluminum and its alloys, definitions and technical discussions of the two welding processes, selection of the proper process for certain job applications, descriptions of manual and automatic equipment, welding power supplies and safety practices.

Illustrations include 100 photographs, charts and detailed diagrams.

(Form ADI 1258 is issued by Air Reduction Sales Company, a division of Air Reduction Company, Inc., Dept. P&PSE, 150 East 42nd St., New York 17, N.Y.)
Circle 9387 inside back cover.

Tells of light insulation for temp. to 1600°F

A pipe and block insulation for temperatures up to 1600°F consists of expanded silica with a specially developed binder, reinforced with an inorganic fiber.

Four-page brochure explains all features, including the insulation's water resistance, light weight at no loss of strength, and ease in cutting without crumbling.

(Careytemp brochure is issued by The Philip Carey Mfg. Company, Dept. P&PSE, Lockland, Cincinnati 15, Ohio.)
Circle 9388 inside back cover.

Gives latest specs on lighting fixtures

Specifications for incandescent and mercury vapor uplight porcelain enamel and aluminum high-mounting units, "all-white" incandescent specs and many upward revisions in specifications for industrial fluorescent fixtures are included in 44-page book.

The new specs are provided to keep pace with increasing demand for higher levels of illumination in factories and with the IES new high footcandle recommendations.

(1959 Specifications Book is available from RLM Standards Institute, Dept. P&PSE, 326 W. Madison St., Chicago 6, Ill.)
Circle 9389 inside back cover.

Heating element catalog

Film-type, sprayed on heating element designed for hard to heat contour surfaces is described in 12-page catalog.

It is said to be exceptionally thin, approximately .015" and very light weight, .07 lb sq ft.

Following engineering data is given: physical, electrical and thermal characteristics, in addition to charts and graphs on protective coatings and insulation temperature rise vs time, (high to low watt densities) and all standard terminals available.

(Catalog HB-3-359 is issued by Electrofilm, Inc., Dept. P&PSE, P.O. Box 106, North Hollywood, Calif.)
Circle 9390 inside back cover.

Recorders measure electrical variables

Twelve-page bulletin describes continuous self-standardizing strip-chart recorders and recording controllers for measurement of electrical and process variables.

The instruments employ electronic servo-operated measuring systems, and provide sufficient torque to operate a variety of control de-

NEW SAFETY TREAD

Super-Stairmaster is the new heavy duty aluminum safety stair tread that repairs and modernizes worn or slippery stairs now available from Wooster Products Inc., Wooster, Ohio.

The new abrasive "TRAFFIC-FLOW" design of the Super-Stairmaster has a magnetic-like grip which provides safe, sure traction on commercial—industrial—institutional stairs and is 100% effective under dangerous wet or oily conditions. Perfect safety for ladies' high heels is a feature of interest to managers of buildings open to the public. The treads are rugged and outwear concrete, stone or marble. Easily applied over all types of stairs. Cleans with once-over-sweeping or vacuum.

Approved and recommended by Safety Engineers. Guaranteed by Warranty Bond.

Complete information on Super-Stairmaster and the repair of stairs by return mail. Write Stairmaster, Dept. S-19, Wooster Products Inc., 100 Spruce St., Wooster, Ohio.

Circle 9391 inside back cover.

LOOKING FOR BELT DRESSING

- Read about the latest development in belt dressings.
- This story is in the New Developments section which starts on page 28.
- You'll find descriptions of many other types of plant and power services equipment there, too.

vices such as switches and slidewires.

Silicon diode voltage source gives continuous standardization without dry cell, standard cell or standardization mechanism. Variables that can be measured with the instruments include kilowatts, kilovars, DC volts, power factor, frequency, time deviation and other electrical quantities plus process variables such as temperature, speed, pressure, pH vibration, moisture, tension, and weight.

(Bulletin GEA-6887 is available from General Electric Co., Dept. P&PSE, Schenectady 5, N. Y.)
Circle 9392 inside back cover.

Specifies hydraulic packings

Sixteen pages of engineering data are contained in bulletin on homogeneous and fabric-reinforced hydraulic packings.

Design, construction, sizes, applications, installation, proper usage and service, and temperature factors for V-rings, U-cups and piston cups are included. Text is accompanied by illustrations, engineering drawings and tables.

(Bulletin P-333 is available from Crane Packing Co., Dept. PI-5, 6400 Oakton St., Morton Grove, Ill.)
Circle 9393 inside back cover.

Explains hook-operated disconnect switches

Series of hook-operated disconnect switches is described and illustrated in twelve-page bulletin.

Included are design features of a single-blade, single-throw switch; a single-blade, double-throw switch; and a tandem-blade, single-throw switch.

Dimensional and mounting details are outlined.

(Bulletin PSE8 is issued by Industrial Material Industries, McGraw-Edison Company, Dept. P&PSE, Milwaukee 1, Wis.)
Circle 9394 inside back cover.

advertisers' index

A

Airetool Manufacturing Company 9

B

Biddle Co., James G. 6

C

Charleston Rubber Company 10
Chicago-Wilcox Mfg. Co. 27
Cobra Metal Hose 27
Coppus Engineering Corporation 37
Crane Co. 41

G

Globe Company, The, Products Division ..... 4th Cover

J

Johnson Corporation, The 43

M

Magnaflux Corporation 37
Morton Salt Company, Industrial Division ..... 2nd Cover

N

Nagle Pumps, Inc. 45
Niagara Blower Company 31

P

Palmer Thermometers, Inc. 14

R

Ruppright's Rotary Roof Cooler 10

S

Sorgel Electric Company 3

V

Vogt Machine Co., Henry ..... 3rd Cover

W

Wooster Products, Inc. 49

Y

Yarnall-Waring Co. 14

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THAT'S INTERESTING

Use for the obsolete

Demise of the street car is helping protect the New Orleans gas system from corrosion. This was reported at the South East and South Central District Meeting of the American Institute of Electrical Engineers.

S. E. Trouard and E. A. Wagner, Jr., of the New Orleans Public Service, Inc., told a symposium on cathodic protection, that old rails from the street car systems are buried deep in the ground beneath the gas lines to form anodes that prevent the coated steel gas pipes from corroding.

Caged 'boom'

Man has always been at the mercy of nature and her whimsical moods, but with increased knowledge of controlled nuclear explosions, man will be able to control climate, prevent earthquakes and divert lava flows from volcanoes before they wreck villages or cities.

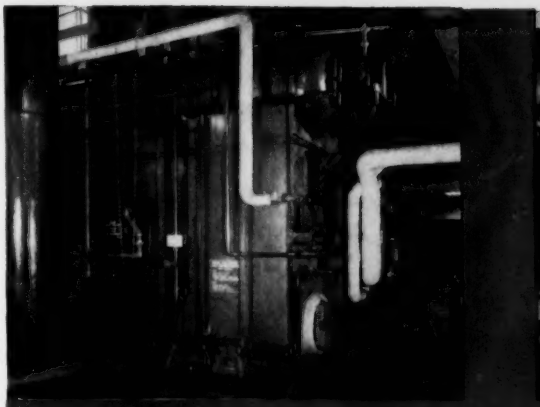
Controlled nuclear explosions also could be used as a heat source for driving a heat engine, according to Francis B. Porzel, Armour Research Foundation, before a meeting of the ASCE.

Two concepts involved in utilizing energy from nuclear explosions are "waste heat" and "channeling concept."

Waste heat concept involves use of the effects of a nuclear blast by controlling the properties of the medium surrounding the bomb or energy source to convert damaging pressure directly into useful heat.

Channeling is a method that includes control of the geometry of the material surrounding the energy source. The energy can be directed almost at will.

However, no mention of radioactive fallout was made in the report.



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PACKAGE WATER TUBE
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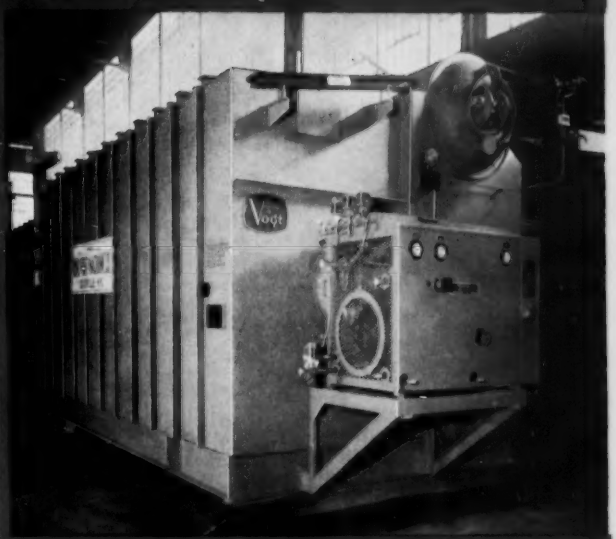
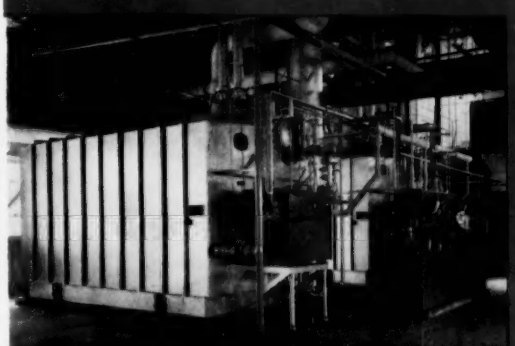
Completely shop fabricated, with burners, controls and accessories installed before shipment.

Placed on a suitable foundation, only fuel, water, breeching and steam connections need to be made to place unit in operation. Vogt Package boilers are available in oil and/or gas fired types in standard pressures of 175, 250 and 375 pounds per square inch gage.



One of two 30,000 lbs/hr units for a hospital

This 10,000 lbs/hr unit is one of two for an office building



Two 25,000 lbs/hr units installed in a manufacturing plant

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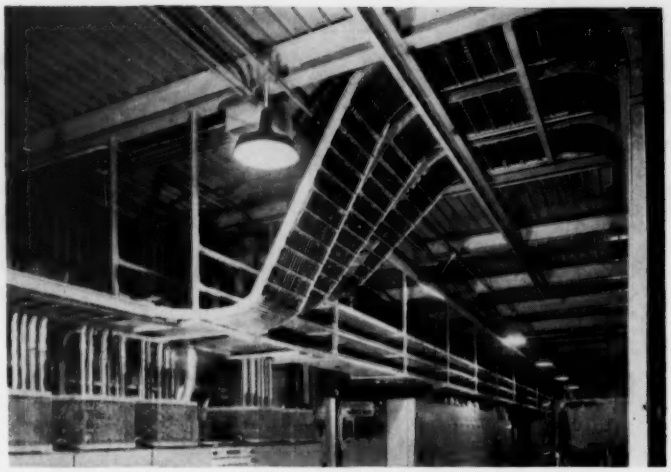
Circle 9395 inside back cover.

how INLAND STEEL uses GLOBE INTERCHANGEABLE TRAYS to support cables in their Indiana Harbor Plant



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★ Complete Accessories for SPEEDIER Installation ★ Complete Interchangeability
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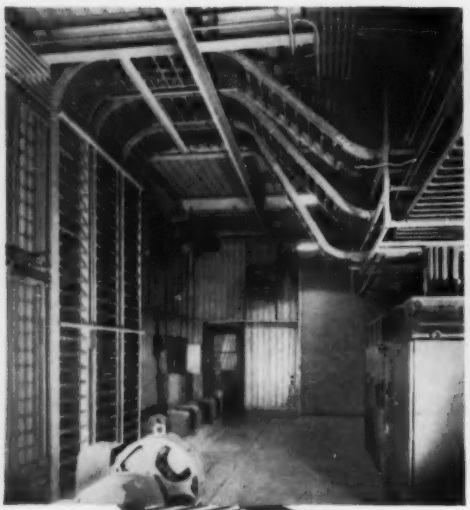
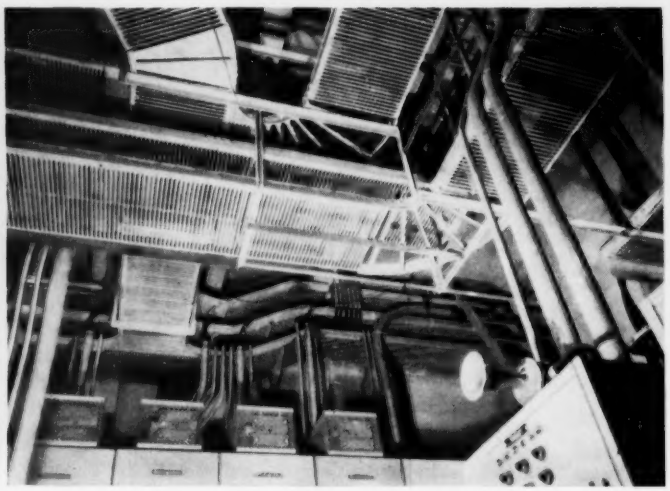
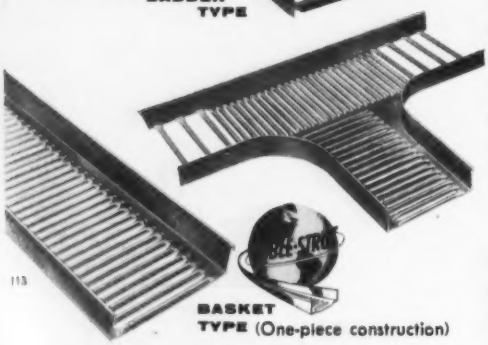




LADDER TYPE



BASKET TYPE (One-piece construction)

Globe's two types of cable trays, one a ladder type and the other a basket type, to support cables, wiring and tubing have become increasingly popular because they can be used INTERCHANGEABLY at any given location depending on the type and weight of the cables to be suspended. The advantages of each type tray can be used to the fullest. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is used for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants and for power distribution in all types of manufacturing processes. Send for FREE catalog giving full information and installation techniques.

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